

THE MOLLUSCAN FAUNA OF THE PLIOCENE STRATA UNDERLYING THE ADELAIDE PLAINS

PART V—GASTROPODA (ERATOIDAE TO SCAPHANDRIDAE)

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SUMMARY

Part V of the study of mollusca from borings into the Pliocene Dry Creek Sands consists of a revision of the gastropod superfamilies Cypraeacea, Naticacea, Tonnacea, Muricacea, Buccinacea, Volutacea, Conacea, and the subclass Opisthobranchia.

The nomenclature of 91 species has been revised and one subgenus and 30 new species have been described.

The stratigraphical position of the "Murray Desert" fossils described by Tate in 1899, many of which occur in the Dry Creek Sands fauna, has been established almost beyond question. These are believed to have come from the Bookpurnong Beds, of possible late Miocene age, whose biofacies is similar to that of the Dry Creek Sands.

INTRODUCTION

Although the similarity between Pliocene molluscan species from the Dry Creek Sands and those of the "Murray Desert" was immediately recognized by Tate (1899, p. 103), it has continued to remain a stratigraphical puzzle.

The writer has recently been fortunate enough, while examining sludges from borings in the north-eastern portion of the Murray Basin in South Australia, not only to confirm the occurrence of some of Tate's species at depth in this area, but to recognize a lithology which leaves little room for doubt that it is that which Tate briefly described as being the distinctive matrix of the Murray Desert fossils (Tate, 1899, p. 103).

The formation has been described elsewhere† as the Bookpurnong Beds. Typically revealed in borings in the Hundred of Bookpurnong, they are of widespread occurrence and could well have been entered in the boring at Tareena from which Tate obtained his material. Their stratigraphical position suggests that they are of late Miocene age, with both Miocene and Pliocene faunal elements. The biofacies is strikingly similar to that of the Dry Creek Sands.

The methods employed in describing the fauna have been outlined in Parts 1 (this Journal, vol. 77), 2 (vol. 78) and 3 (vol. 79) in this series.

Superfamily CYPRAEACEA

Family ERATOIDAE

Subfamily ERATOINAE

Genus PROTERATO Schilder, 1927

Proterato Schilder, 1927, Arch. für Naturgesch., 91, A, 10, 1925, p. 57.

Type species (o.d.) *Erato neozelanica* Suter

Subgenus CYPRAEERATO Schilder, 1932

Cypraeerato Schilder, 1932, Foss. Cat., 55, p. 86.

Type species (o.d.) *Erato bimaculata* Tate

Proterato (*Cypraeerato*) *subaustralis* sp. nov.

pl. 1, figs. 1, 2

Proterato australis (Tate), Ludbrook, 1941, Trans. Roy. Soc., S. Aust., 65 (1), p. 100.

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† Jour. Roy. Soc. N.S.W., Vol. 90, p. 179, 1957.

Diagnosis—A medium-sized *Cypraeo* acute both anteriorly and posteriorly, with a small, roundly elevated spire. Protoconch small and flattened. Outer lip with 18 denticles the anterior of which are sometimes reflected on to the dorsal surface. Columella with three oblique anterior terminal ridges followed by a few columellar denticles.

Description of Holotype—Shell elongate-oval, acute at both ends, spire small, elevated, roundly conical. Protoconch very small and flattened, of one-and-a-half smooth, narrow turns. Adult whorls 4, body whorl large, nearly five-sixths total height of shell, roundly curving for two-thirds of its distance from the suture, then somewhat abruptly attenuated towards the anterior. Aperture long, narrow, oblique, slightly insinuated posteriorly and narrowed anteriorly. Outer lip thickened and inflected, posteriorly projecting, attached nearly at the top of the penultimate whorl, bearing eighteen denticles which are long and horizontal except for the anterior two which are somewhat oblique. Columella with three oblique anterior terminal ridges followed by a few columellar denticles over portion of the length. Fossula wide, long, slightly concave, angular anteriorly.

Dimensions—Height 5.1, diameter 3.3, height of body whorl 4.5 mm.

Type Locality—Hindmarsh Bore, 450-487 feet.

Location of Holotype—Tate Mus. Coll., Univ. of Adelaide, F 15179.

Material—The holotype and 3 paratypes, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Hindmarsh Bores.

Subfamily TRIVIINAE

Genus ELLATRIVIA Iredale, 1931

Ellatrivia Iredale, 1931. Rec. Aust. Mus., 18 (4), p. 221.

Type species (o.d.) *Trivia merces* Iredale

Ellatrivia wirrata Ludbrook

Ellatrivia wirrata Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 94, pl. 5, fig. 16.

Diagnosis—An *Ellatrivia* of moderate size with a conspicuous and globular spire and strongly projecting outer lip. Dorsal surface with about 35 ribs, 20 of which continue over the outer lip and 20 over the columella. Fossula deep and wide; columellar sulcus narrower.

Dimensions—Length 9, breadth 7, height 6 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., Univ. of Adelaide, T 1665.

Observations—One example only from Weymouth's Bore has been found since the species was described from Abattoirs Bore. It is a globular species with close and fine ribs, from which it differs from the Recent type species *F. merces*. The genus, which is well-represented in the Australian Tertiary has Indo-Pacific Recent relatives in *E. sauis* (Schilder), *E. problematica* (Schilder) and *E. sibogae* (Schepman) (Schilder, 1935, p. 332).

Material—3 paratypes, Abattoirs Bore; one specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores.

Family CYPRAEIDAE

Subfamily CYPRAEOVULINAE

Genus NOTOCYPRAEA Schilder, 1927

Notocypraea Schilder, 1927. Arch. für Naturgesch., 91 A, 10, 1925, p. 110.

Type species (o.d.) *Cypraea piperita* Gray

Notocypraea eryma Cotton

Notocypraea eryma Cotton, 1947. Rec. S. Aust. Mus., 8 (4), p. 663, pl. 21, figs. 6, 7, 8.

Diagnosis—A small *Notocypraea* with the anterior extremity somewhat produced. Columellar teeth fine, short, about 21 in number, fossula moderately

concave. Outer lip produced and curved posteriorly with about 24 fine short teeth.

Dimensions—Height 21, diameter 13 and 12 mm.

Type Locality—Abattoirs Bore, 320-410 feet.

Location of Holotype—S. Aust. Mus., P 8357.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Genus *UMBILIA* Jousseaume, 1884

Umbilia Jousseaume, 1884. Bull. Soc. Zool. France, 19, p. 90.

Type species (monotypy) *Cypraea umbilicata* Sowerby (= *hesitata* Iredale)

Umbilia cera Cotton

Umbilia cera Cotton, 1947. Rec. S. Aust. Mus., 8 (4), p. 667, pl. 21, figs. 1, 2, 3.

Diagnosis—An *Umbilia* of fairly small size more elevated at the posterior; aperture wide strongly turned to the left posteriorly, posterior canal short and downwardly curved. Outer lip broad, with 26 teeth; columella with 2 teeth.

Dimensions—Height 55, diameter 37 and 27 mm.

Type Locality—Abattoirs Bore, 320-410 feet.

Location of Holotype—S. Aust. Mus., P 8339.

Observations—Except for the fragment from Kooyonga Bore, no other examples of this species have been recovered from borings in the Adelaide District.

Material—Holotype and portion of specimen showing outer lip and posterior features.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Kooyonga Bores, Adelaide.

Superfamily NATICACEA

Subfamily GLOBULARINAE

Genus *GLOBULARIA* Swainson, 1840

Globularia Swainson, 1840. Treat. Malac., p. 345.

(*Ceratina* Gray, 1840. Syn. Conch. Brit. Mus., ed. 42, p. 147 nom. nud.)

(*Anomphala* Hermannsen, 1846. Ind. Gen. Mal., 1, p. 61.)

Type species (s.d. Gray, 1847) *Natica fluctuata* Sowerby

Subgenus *GLOBULARIA* s. str.

Globularia (*Globularia*) sp. indet.

cf. *Ampullina* sp. Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Observations—Most unfortunately the five specimens obtained from Abattoirs Bore have all been shattered and it is impossible to describe the characters of the body whorl. All five spires are preserved and they, together with such portions of the body whorl as remain, indicate a shell most remarkably like *Globularia sigaretina* Lamarck, from the Calcaire Grossier of Grignon of which there are 9 excellent specimens for comparison in the British Museum Collection. The shells are similar in size, number of whorls and in general appearance, and the Adelaide shell is therefore assigned on the analogy to *Globularia*. The Paris Basin species is thin while the Adelaide shell is thick and relatively solid. The type species of the genus is a Philippine shell, so that the genus in the strict sense is Indo-Pacific in Recent times.

Subfamily POLINICINAE

Genus *POLINICES* Montfort, 1810

Polinices Montfort, 1810. Conch. Syst., 2, p. 222.

Polinices Blainville, 1826. Dict. Sci. Nat. (ed. 2), 42, p. 310.

(*Polynices* Menke, 1830. Syn. Meth. Moll., ed. 2, p. 47.)

Type species (monotypy) *Polinices albus* Montfort = *Nerita mamilla* Linné

Subgenus *POLINICES* s. str.

(*Albula* Röding, 1798. Mus. Belt., p. 21, non Gronow, 1763.)

(*Naticina* Guilding, 1837. Trans. Linn. Soc. Lond., 17 (1), p. 30.)

- (*Naticella* Guilding, 1840, in Swainson Treat. Malac., p. 345.)
 (*Mammillaria* Swainson, 1840, *ibid.*)
 (*Mammillaria* Herrmannsen, 1847. Ind. Gen. Moll., 2, p. 16.)
 (*Uher* Philippi, 1853. Handb. Conch. Malac., p. 497.)
 (*Mamma* Mörch, 1852. Cat. Conch., 1, p. 132.)

***Polinices (Polinices) subjugum* (Cotton)**

- Natica gibbosa* Hutton, Tate, 1890a. Trans. Roy. Soc. S. Aust., 13 (2), p. 177; Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 320, pl. 6, fig. 4; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), pp. 113, 144.
Uher (?) huttoni von Ihering, Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.
Uher subjugum Cotton, 1947. Rec. S. Aust. Mus., 8 (4), p. 668, pl. 21, figs. 15, 16.

Diagnosis—A large *Polinices* with a small spire only slightly projecting above the body whorl. Body whorl large, gibbous posteriorly; columellar callus very thick, wider than the parietal callus and spreading over the body whorl.

Dimensions—Length 30, width 27 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—S. Aust. Mus. Coll., P 8359.

Material—Holotype.

Stratigraphical Range—Miocene to Dry Creek Sands.

Geographical Distribution—Port Phillip Bay-Adelaide, S. Aust.

Subgenus CONUBER Finlay & Marwick, 1937

- Conuber* Finlay & Marwick, 1937. N.Z. Geol. Surv. Pal. Bull. 15, p. 53.

Type species (o.d.) *Natica conica* Lamarck

***Polinices (Conuber) subvarians* (Tate)**

- pl. 1, figs. 3, 4
Natica subvarians Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 322, pl. 6, figs. 8, 10; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 113, 138; Crespin, 1943. Aust. Min. Res. Surv. Bull., 9, p. 98.
Polinices subvarians Tate, Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—An elongate-ovate *Conuber* of moderate size with a relatively high acute spire. Protoconch of 2 small helicoid turns, adult whorls 4 in a height of 22 mm. Body whorl convex but not ventricose. Sculpture of numerous fine axial growth striae, only slightly modified by the intrusion of the parietal callus.

Description of Hypotype—Shell solid, elongate-ovate, of moderate size, spire relatively high, acute, conical. Protoconch of 2 small, rather flattened, smooth helicoid turns. Adult whorls 4, rapidly increasing, suture concealed. Body whorl large oblique, convex, not ventricose. Surface smooth and shining with numerous fine axial slightly waving growth striae which are only slightly modified at the suture by the intrusion of the parietal callus. Aperture semilunate, umbilicus of moderate size with a long, narrow funicle in the anterior third, and restricted in the posterior half by the parietal callus which is abruptly terminated below, leaving the umbilicus exposed between it and the funicle.

Dimensions—Length 22, width 15.5, length of aperture (external oblique measurement to apparent suture) 16, aperture (internal measurement) 10, width of aperture (internal) 6 mm.

Type Locality—(here designated) Jimmy's Point, Gippsland, Vic.; Kalinman.

Location of Holotype—Tate Mus. Coll., Univ. of Adelaide, T 1486C.

Location of Hypotype—Tate Mus. Coll., F 15180.

Locality of Hypotype—Hindmarsh Bore, 450-187 feet.

Observations—This species has never been fully described. It was figured by Tate and compared with *P. (C) varians* and *P. (C) conica* (Lamarck). It is common throughout the Pliocene deposits of Southern Australia. The subgenus is apparently restricted to this area.

Material—Hypotype and numerous specimens, Hindmarsh Bore. Two specimens Weymouth's Bore. One very well preserved shell not fully grown

from Abattoirs Bore showing colour markings in shades of pale brown following the lines of growth.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

***Polinices (Conuber) cunninghamensis* (Harris)**

pl. 1, figs. 5, 6

Natica varians Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 322, pl. 6, figs. 2, 9 (non Dujardin).

Natica cunninghamensis Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 257, nom. mut.; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 114.

Natica cunninghami Harris, Crespin, 1943. Aust. Min. Res. Surv. Bull., 9, p. 98.

Diagnosis—A large solid *Conuber* with a short spire and a large body whorl. Umbilicus large, funicle long and narrow; parietal callus thick, terminating abruptly below and leaving the umbilicus exposed between it and the funicle.

Dimensions—Length 40, width 32, length of aperture 31.5, width of aperture 17 mm.

Type Locality—Muddy Creek, Vic.; Kalimnan.

Location of Holotype—Tate Mus. Coll., T 1504.

Observations—A single specimen was recovered from Thebarton Bore. It has not previously been recorded from the Pliocene of South Australia.

Material—The figured hypotype Tate Mus. F 15181, Thebarton Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic., to Adelaide, S. Aust.

***Polinices (Conuber) balteatella* (Tate)**

pl. 1, figs. 7, 8

Natica balteatella Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 221, pl. 6, fig. 7; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 144.

Polinices balteatellum Tate, Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A narrowly-conical small *Conuber* with a conspicuous acute spire and a comparatively long, narrow body whorl. Anterior to the suture there is a broad band, depressed, sculptured with spiral striae which are wavy, crowded and irregularly spaced, and not shining as the rest of the whorl. Both band and remainder of whorl sculptured with numerous growth striae.

Dimensions—Length 18.5, width 7.5, height of aperture 8.5, width of aperture 6.5, width of umbilicus 3 mm.

Type Locality—Dry Creek Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1540B.

Observations—This is the most narrowly restricted of the *Polinices* in the Australian Pliocene. It has so far not been found outside borings in the Adelaide area. It is recognizable mainly by the conspicuous ante-sutural band with its conspicuous though fine spiral sculpture.

Material—The figured hypotype Tate Mus. F 15182 and 2 other specimens Thebarton Bore, 1 specimen Hindmarsh Bore, 2 specimens Kooyonga Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Genus SIGARETOTREMA Sacco, 1890

Sigaretotrema Sacco, 1890. Boll. Mus. Zool. Anat. Comp. Torino., 5 (86), p. 36.
(*Propesium* Iredale, 1924. Proc. Linn. Soc. N.S.W., 49 (3), 197, pp. 183, 256.)

Type species (monotypy) *Sigaretus michaudi* Michelotti

***Sigaretotrema subinfundibulum* (Tate)**

Natica subinfundibulum Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 327, pl. 10, fig. 11, pl. 6, fig. 6.

Natica (Sigaretopsis) subinfundibulum Tate, Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 263.

Natica subinfundibulum Tate, Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), pp. 114, 138, 144.

Sigaretotrema subinfundibula (Tate), Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A thin, depressed *Sigaretotrema* with a short spire. Aperture semilunate, columella almost vertical; umbilicus large and perspective, funicle absent, parietal callus narrow, even.

Dimensions—Length 13, width 13, height 8, basal length of aperture 12, width of umbilicus 4.5 mm.

Type Locality—Muddy Creek, Victoria. Miocene.

Location of Holotype—Tate Mus. Coll., T 1496.

Observations—This long-ranging and widespread species was recorded from Abattoirs Bore, but has not been found in any of the bores under present consideration.

Material—3 topotypes, Muddy Creek, B.M. Coll.

Stratigraphical Range—Miocene-Pliocene.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Subfamily NATICINAE

Genus TANEA Marwick, 1931

Tanea Marwick, 1931. N.Z. Geol. Surv. Pal. Bull. 13, p. 98.

Type species (o.d.) *Natica zelandica* Quoy & Gaimard

Tanea hamiltonensis (Tenison Woods)

pl. 1, figs. 9, 10

Natica wintlei var. *Hamiltonensis* Tenison Woods, 1879. Proc. Linn. Soc. N.S.W., 3 (3), p. 229, pl. 21, fig. 8.

Natica hamiltonensis Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 319, pl. 10, fig. 6; Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 256; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), pp. 113, 138; Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100; Crespin, 1943. Aust. Min. Res. Surv. Bull. 9, p. 98.

Diagnosis—A globulose, thin *Tanea* of moderate size, spire short, sutures conspicuous, linear. Protoconch of two and a half rather elevated turns, adult whorls inflated, body whorl very rotund. Umbilicus narrow, funicle generally prominent, parietal callus very thin, scarcely extending to the angulate junction of the outer lip with the whorl.

Dimensions (Holotype)—Height 8, diameter 8 mm.

Type Locality—Muddy Creek, Victoria; Miocene.

Location of Holotype—Australian Museum, Sydney, No. 1702.

Dimensions (Hypotype, Tate, 1893)—Height 20, diameter 19, vertical height of aperture 15, radius of aperture 11, width of umbilicus 2 mm.

Location of Hypotype—Tate Mus. Coll., F 15183.

Observations—This is a very widely distributed and long ranging species, although it is possible that more than one species have been recorded under the name. It has been found only in the Abattoirs and Weymouth's Bores in the Adelaide District and the specimen figured (pl. 1, figs. 9, 10) is from Abattoirs Bore.

Material—The figured hypotype, Abattoirs Bore; 32 mostly immature specimens, Weymouth's Bore.

Stratigraphical Range—"Tertiary".

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Genus TANIELLA Finlay & Marwick, 1937

Taniella Finlay & Marwick, 1937. N.Z. Geol. Surv. Pal. Bull., 15, p. 48.

Type species (o.d.) *Natica notovenica* Finlay

Taniella weymouthensis sp. nov.

pl. 1, figs. 13, 14

Diagnosis—A small *Taniella*, roundly ovate, with a low spire. Protoconch of 3 small helicoid turns with a very small nucleus, the first two whorls more convex than the third which is narrow and comparatively flat. Body whorl

large. Aperture semilunate and almost vertical. Umbilicus with a large broad heavy funicle.

Description of Holotype—Shell small, roundly ovate, spire very low, scarcely elevated above the body whorl. Suture inconspicuous, tangential. Protoconch helicoid of three smooth flattened turns with a very small nucleus, the first two noticeably more convex than the last turn, which is flattened and narrow, and which widens conspicuously into the first adult whorl. Adult whorls two, rapidly increasing body whorl large and obliquely ovate. Aperture large and almost vertical, semilunate. Umbilicus large with a broad and heavy funicle; parietal callus rather thin and scarcely spreading on to the body whorl.

Dimensions—Height 4, diameter 4.9, height of aperture 3.3, width of aperture 1.9 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15184.

Observations—The genus *Taniella*, with the description of the above and the two following species, is well-established in the Australian Tertiary; when the genus was introduced *Natica subnoae* Tate was the only known representative. The genus ranges from Bortonian to Nukumaruan in New Zealand and is represented in the Parisian Eocene as speculated by Finlay & Marwick (1937, p. 49). The Parisian Eocene species *epiglottina* Lamarek, *migroglossa* Deshayes, *hemipleres* Cossmann belong to *Taniella* rather than to *Tectonatica* in which the disposition of the funicle is quite distinct from that of *Taniella* where it is set more anteriorly and is not welded to the posterior part of the umbilicus. The Australian representatives of *Taniella* are very close to those of the Parisian Eocene.

T. weymouthensis is very close to *T. subnoae*, from which it differs in its almost vertical aperture in contrast with the oblique aperture of *subnoae*. The funicle is narrower than in *subnoae*. The protoconchs are almost identical, with the exception of the marked narrowing of the third embryonic whorl in *weymouthensis*.

Material—Holotype and 18 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Genus PROXIUBER Powell, 1933

Proxiuber Powell, 1933. Trans. N.Z. Inst., 63, p. 167.

Type species (o.d.) *Lunatia australis* Hutton

Proxiuber microsculptum sp. nov.

pl. 1, figs. 15, 16

Diagnosis—A *Proxiuber* of moderate size, obliquely ovate, with a low spire. Protoconch of two broad, flattish, smooth turns, followed by two adult whorls rapidly increasing, very finely and microscopically sculptured with frequent growth striae, faintly crossed, particularly just below the suture, with close spiral striae. Body whorl large, aperture large and semilunate slightly oblique. Umbilicus large, funicle very low, parietal callus thin.

Description of Holotype—Shell small, obliquely ovate, spire very low, scarcely elevated above the body whorl. Suture linear. Protoconch relatively large, paucispiral, of two smooth, broad, flattish turns, nucleus large. Adult whorls two, rapidly increasing body whorl, large and obliquely ovate. Whorls very finely sculptured with frequent growth striae crossed particularly just below the suture with frequent microscopic spiral striae. Aperture large, semilunate, slightly oblique. Umbilicus large with a very low funicle, parietal callus thin.

Dimensions—Length 9, width 7.5, length of aperture (oblique measurement) 7.5, width of aperture 3.5 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15185.

Observations—The species is readily distinguishable by the umbilical characters combined with the paucispiral protoconch. The almost complete absence of funicle distinguishes the genus from the small shells of the genus *Taniella*.

Material—Holotype and 10 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Genus *Austrocochlis* Finlay & Marwick, 1937

Austrocochlis Finlay & Marwick, 1937. N.Z. Geol. Surv. Pal. Bull., 15, p. 51.

Type species (o.d.) *Natica substolida* Tate

Austrocochlis substolida (Tate)

pl. 1, figs. 11, 12, 19, 20

Natica substolida Tate, 1893b. Trans. Roy. Soc. S. Aust., 17, p. 323, pl. 6, fig. 3.

Natica (Lunatia) substolida Tate, Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 260.

Natica substolida Tate, Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), pp. 113, 138.

Austrocochlis substolida (Tate), Finlay & Marwick, 1937. N.Z. Geol. Surv. Pal. Bull., 15, p. 51.

Polinices substolidus (Tate), Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Polinices substolida (Tate), Cressin, 1943. Aust. Min. Res. Surv. Bull., 9, p. 98.

Diagnosis—A large broadly ovate *Austrocochlis* with a very short spire. Protoconch large and paucispiral of one-and-a-half turns, with a very large flat nucleus. Body whorl large and convex. Umbilicus of moderate size, with a low broad funicle, which is generally keeled below and has a wide space below. Parietal callus thick, extending on to the funicle.

Dimensions—Length 23, width 21, height of aperture (oblique measurement) 19, width of aperture 12 mm.

Type Locality—Muddy Creek, Victoria; Miocene.

Location of Holotype—Tate Mus. Coll., T 1493.

Observations—Adelaide specimens of this species like those of the Kalimnan of Muddy Creek grow to a large size and are thick and heavy. Finlay & Marwick have suggested (1937, p. 51) that the species has points of agreement with *Sigatica hantoniensis* (Pilkington) and may be related, but comparison of the two species shows their umbilical characters to be distinct and the type of protoconch to be very different.

Material—The figured hypotypes, Jones's Bore (Tate Mus. F 15186) and Weymouth's Bore (Tate Mus. F 15187); one gerontic specimen Thebarton Bore, 3 specimens Weymouth's Bore, 4 specimens Tennant's Bore, 3 specimens Abattoirs Bore, 7 specimens from the Kalimnan and 3 from the Balcombian Muddy Creek, Victoria, B.M. Coll.

Stratigraphical Range—Miocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Genus *Tasmatica* Finlay & Marwick, 1937

Tasmatica Finlay & Marwick, 1937. N.Z. Geol. Surv. Pal. Bull., 15, p. 51.

Type species (o.d.) *Natica schoutanica* May

Tasmatica modestina sp. nov.

pl. 1, figs. 17, 18

Diagnosis—A small *Tasmatica* with a very low spire. Protoconch of one-and-a-half flat, smooth, shining turns. Adult whorls two, finely sculptured with axial growth lines crossed by microscopic spiral striae which are stronger in a narrow band just below the suture. Parietal callus thick, joined to the funicle and irregularly denticulate from the anterior end of its junction with the body whorl to the funicle.

Description of Holotype—Shell small, ovate, spire very low, scarcely elevated above the body whorl. Suture linear. Protoconch paucispiral of one-and-

a-half flat, smooth, shining turns. Adult whorls two, rapidly increasing, body whorl large; whorls finely sculptured with microscopic, frequent axial growth striae crossed by microscopic spiral striae, which are stronger in a narrow band just below the suture. Aperture fairly large, subluminate, rather oblique at about 18° to the vertical; parietal callus thick, joined to the funicle and irregularly denticulate from the anterior end of its junction with the body whorl to the funicle.

Dimensions—Length 4.5, width 4.5, height of aperture 3, width of aperture 1.5 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15188.

Observations—The species so far appears to be of infrequent occurrence; it is most readily distinguishable by its umbilical features with the funicle merging into the parietal callus on its upper side where it is weakly denticulate, and the paucispiral protoconch.

Material—Holotype and 14 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Range—Weymouth's Bore, Adelaide.

Superfamily TONNACEA

Family CASSIDIDAE

Genus *CASSIS* Scopoli, 1777

Cassis Scopoli, 1777. *Int. Nat. Hist.*, p. 303.

(*Cassida* Brunnich, 1772. *Zool. Fossil*, p. 248, non Linné.)

(*Cassidea* Bruguière, 1792. *Ency. Meth. (Vers.)*, p. 414.)

(*Fimbriola* Scudder, 1882. *Nam. Zool. Supp.*, p. 138 (nom. nud.).)

(*Cassisoma* Rovereto, 1899. *Atti. Soc., Lagustica*, 10, p. 107.)

Type species (s.d. Montfort, 1810) *Buccinum cornutum* Linné

Subgenus *HYPOCASSIS* Iredale, 1927

Hypocassis Iredale, 1927. *Rec. Aust. Mus.*, 15 (5), p. 329.

Type species (o.d.) *Cassis bicarinata deeresensis* Hedley

Cassis (Hypocassis) salisburyensis sp. nov.

pl. 2, figs. 1, 2

Cassis fimbriata Quoy, Tate, 1830a. *Trans. Roy. Soc. S. Aust.*, 13, p. 176; Denham & Kitson, 1903. *Rec. Geol. Surv., Vic.*, 1 (2), p. 143.

Hypocassis textilis (Tate) Ludbrook, 1941. *Trans. Roy. Soc. S. Aust.*, 65 (1), p. 160.

Diagnosis—A small, stout *Hypocassis* moderately ventricose with a short spire. Body whorl with 10 prominent tubercles, on the posterior angle of the whorl, decreasing in number and prominence in a second and third row of tubercles at the middle of the whorl. Outer lip denticulate.

Description of Holotype—Shell small, stout, with a short, small, acute spire. Protoconch globose, with reverted and immersed lip. Adult whorls five, with an elevated sharp varix about every two-thirds of a whorl. Sculptured on the spire whorls inconspicuous of fine spiral threads crossed by growth folds somewhat nodulose at the suture. Body whorl with a posterior row of ten prominent sharp tubercles, a median row of light tubercles decreasing in prominence towards the aperture and an anterior row of six less prominent and more elongate tubercles. Posterior area concave. Aperture fairly large, outer lip thickened, with about twelve long denticles. Inner lip widely spreading, projecting posteriorly and terminated by a varix. Columella strongly twisted beneath the callus, with about 6 denticles, well within the aperture. Callus with five long wrinkles at the anterior end of the columella. Anterior canal very recurved.

Dimensions—Length 42, breadth 30, height 25. Length of aperture (external) 37, (internal) 26 mm.

Type Locality—Tennant's Bore, Salisbury.

Location of Holotype—Tate Mus. Coll., F 15189.

Observations—This species is intermediate between *C. textilis* Tate and *C. exigua* Tenison-Woods. It differs from *exigua* in being less strongly sculptured on the spire and in having 3 rows of less numerous tubercles. It differs from *textilis* in having 10 instead of nine tubercles on the body whorl and in being less inflated, with a lower spire. It is a much smaller and thicker shell than *C. fimbriata* Quoy.

Material—Holotype and 4 broken paratypes Tennant's Bore; one fragment Kooyonga Bore; one juvenile paratype Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Genus SEMICASSIS Mörch, 1852

Semicassis Mörch, 1852. Cat. Conch., 1, p. 112.

Type species (s.d. Harris, 1897) *Cassis japonica* Reeve.

Subgenus ANTEPHALIUM Iredale, 1927

Type species (n.d.) *Cassis semigranosa* Lamarck

Semicassis (*Antephalium*) *muelleri* Tate

pl. 2, figs. 3-4

Semicassis muelleri Tate, 1889. Trans. Roy. Soc. S. Aust., 11, p. 167, pl. 7, fig. 9; Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 199; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 137.

Antephalium muelleri (Tate) Cressin, 1943. Min. Res. Surv. Bull., 9, p. 95 (err. pro *Antephalium*).

Diagnosis—A small *Antephalium* with a moderate spire; moderately inflated; protoconch conspicuous of two smooth, inflated whorls, adult whorls four in a height of 25 mm. Spire whorls with about four spiral ribs crossed and tessellated by oblique axial lirae; interspaces striated by growth lines. Body whorl with five spiral ribs, unequally spaced on the posterior area, crossed and crenulated by oblique axial ridges which weaken over the shoulder and become obsolete on the anterior portion of the whorl which is closely axially striate. Columella medially thickened, nearly straight, with about 10 oblique folds on the anterior portion.

Dimensions—Length 25, breadth 20, length of aperture 18 mm.

Type Locality—Muddy Creek, Victoria; Kalimnan.

Location of Holotype—Tate Mus. Coll., T 754A.

Observations—The holotype appears to be an inflated form of this species of which usual measurements are: Length 27, breadth 18 mm. The hypotype from Tennant's Bore is somewhat worn and less strongly sculptured than the typical species. Iredale (1927, pp. 323, 324) has stated that *muelleri* is strictly ancestral to the Recent *S. (Xenogalea) nivea*; there is no resemblance between *muelleri* and the subgenus *Xenogalea* of which the species are larger, inflated shells differently sculptured, with, at least in the type species, multispiral protoconch. *S. (A.) muelleri* is a typical *Antephalium*.

Material—Figured hypotype (Tate Mus., F 15190), Tennant's Bore; one juvenile, Hindmarsh Bore; 3 topotypes, Muddy Creek, B.M. Coll.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Australia.

Semicassis (*Antephalium*) *sufflata* (Tenison Woods)

Cassis sufflata Tenison Woods, 1877. Proc. Roy. Soc. Tas. for 1876, p. 93; 1898, Proc. Roy. Soc. Vic., 8 (n.s.), p. 106.

Semicassis sufflata Tenison-Woods, sp. Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 195; Cressin, 1943. Min. Res. Surv. Bull., 9, p. 98.

Semicassis transenna Tate, 1889. Trans. Roy. Soc. S. Aust., 11, p. 166, pl. 8, fig. 2; 1889a, Trans. Roy. Soc. S. Aust., 23, p. 104; Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 108; Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—An *Antephalium* of moderate size with an elevated spire. Protoconch of two and a half smooth turns, adult whorls 4, subangulate in the

posterior third and somewhat excavate in front of the suture; sculptured with spiral threads, of which there are about 12 on the penultimate whorl, cancellated by axial almost equidistant threads with fine striae of growth between. Cancellation becoming obscure towards the middle of the body whorl and axial growth lines only remaining.

Dimensions—Length 37, breadth 23, length of aperture 26, width of aperture 12 mm.

Type Locality—Table Cape, Tasmania.

Location of Holotype—(?) Hobart Museum.

Observations—The species has been recorded only from Abattoirs Bore. Pritchard's opinion followed by Harris that *Semicassis transenna* Tate is synonymous with *Cassis sufflatus* Tenison-Woods is here accepted provisionally. The holotype of *sufflatus* has never been figured or compared with the holotype of *transenna*, which, according to Tate (1889, p. 166) also occurs at Table Cape; Dennant who considered *transenna* distinct from *sufflatus* (1903, p. 108) excluded *transenna* from the Table Cape fauna.

Material—23 specimens, Muddy Creek, and 4 specimens, Schnapper Point, Vic.; B.M. Coll. 3 specimens, Abattoirs Bore.

Stratigraphical Range—Janjukian-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Subgenus CASMARIA H. & A. Adams, 1853

Casmaria H. & A. Adams, 1853. Gen. Rec. Moll., 1, p. 216.

(*Casmeria* Jousseaume, 1888. Mem. Soc. Zool. France, 1, p. 190.)

Type species (s.d. Harris, 1897) *Buccinum vibex* Linné.

Semicassis (?) *Casmaria* radiata Tate

Semicassis radiata Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 168, pl. 8, fig. 3; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 34; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—Shell small, spire of moderate length, acute. Protoconch small, of one-and-a-half smooth whorls followed by four adult whorls with a concave depression before the suture and a marginal rib at the suture. Whorls sculptured with straight crowded, fine costae, of which there are 24 on the body whorl, strongest on the median portion on the whorl, interrupted on the shoulder by three inconspicuous angulations and becoming obsolete in the other direction towards the base. Columella convex, with fine folds on the anterior and a small tubercle at the posterior angle.

Dimensions—Length 23, breadth 15, length of aperture 18 mm.

Type Locality—Well sinking, Tareena, N.S.W.

Location of Holotype—Tate Mns. Coll., T 751.

Observations—The identification of the species from fragmentary material is doubtful. It is assigned to the subgenus *Casmaria* only tentatively on its analogy with the Recent *Casmaria ponderosa* (Gmelin) = *torquata* Reeve.

Material—Holotype; 6 juveniles, 3 fragments, Abattoirs Bore.

Stratigraphical Range—? Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—Tareena, N.S.W.-Adelaide, S. Aust.

Family CYMATHIDAE

Genus ARGOBUCCINUM Herrmannsen, 1846

Argobuccinum Herrmannsen, 1846. Ind. Gen. Mal., 1, p. 77.

Type species (monotypy) *Murex argus* Linné.

Subgenus ARGOBUCCINUM s. str.

(Priene H. & A. Adams, 1858. Gen. Rec. Moll., 2, p. 354.)

(*Gondwanula* Finlay, 1927. Trans. N.Z. Inst., 57, p. 399.)

Argobuccinum (*Argobuccinum*) *bassi* Angas

pl. 2, figs. 5, 6.

Triton bassi Angas, 1869. Proc. Zool. Soc., p. 45, pl. 2, fig. 2.

Gondwanula bassii Angus, Cotton & Godfrey, 1931. S. Aust. Nat., 13 (1), p. 11; 1938, Mal. Soc. S. Aust., 1, p. 21.

Diagnosis—An ovately-fusiform, small *Argobuccinum* with a moderate spire and about five varices. Whorls sculptured with irregular, narrow, flattened spiral threads, wider than the interspaces and inconspicuously, irregularly, flatly beaded by crowded axials crossing both threads and interspaces. Body whorl angled posteriorly with 7 tubercles between the varices on the angle and three inconspicuous rows of narrow elongate tuberculate swellings of the spiral threads at fairly wide intervals below.

Outer lip of aperture varicose behind, interior with a row of 13 fine paired denticles. Inner lip with 6 denticles at the base of the columella and a callosity at the posterior angle.

Dimensions—Height 27.5, diameter 17 mm.

Type Locality—Corner Inlet, Bass Strait; Recent.

Location of Holotype—B.M. Coll.

Observations—This is the first record of this species from the Dry Creek Sands. The two specimens figured, the smaller (pl. 2, fig. 5) from Thebarton Bore and the larger (pl. 2, fig. 6) from Abattoirs Bore, are respectively smaller and larger than the holotype with which they have been compared. There appears to be no recognizable generic difference between *Argobuccinum* and *Gondwanula*.

Material—Holotype, B.M. Coll.; figured hypotypes, F 15191, Abattoirs Bore, and F 15192 Thebarton Bore.

Stratigraphical Range—Dry Creek Sands—Recent.

Geographical Distribution—Beachport to St. Francis Island, S. Aust.

Genus CYMATIELLA Iredale, 1924

Cymatiella Iredale, 1924. Proc. Linn. Soc. N.S.W., 49 (3), 197, p. 183.

Type species (o.d.) *Triton quoyi* Reeve = *T. verrucosus* Reeve.

Cymatiella adelaidensis Ludbrook

Cymatiella adelaidensis Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1).

Diagnosis—A *Cymatiella* of moderate size with a protoconch of three smooth globose turns and six adult whorls in a height of 15 mm. A strong varix every three-quarters of a whorl with five prominent axial costae between the varices. Axial sculpture crossed by about 15 small, narrow spiral riblets, wider than interspaces and unequal in size and spacing. Outer lip strongly variced, with about eight coarse denticles within.

Dimensions—Height 15, diameter 8 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1646.

Observations—The species has not been recorded from any other boring than Abattoirs. Its nearest ally is *C. sexcostatum* (Tate) from the Pliocene of Aldinga Bay which has six intervariccal costae and four spiral ribs on each whorl, with nodules at the intersection of axial and spiral sculpture.

Material—Holotype and six paratypes, Abattoirs Bore; 2 specimens Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Genus CHARONIA Gistel, 1848

Charonia Gistel, 1848. Naturgesch. Thierr., p. 170. (1847) 1850, Handb. Naturgesch., p. 559.

(*Tritonium* Link, 1807. Besch. Nat. Samml. Rostock, p. 121, non Q. F. Muller, 1776.)

(*Triton* Montfort, 1810. Conch. Syst., 2, p. 586, non Linné, 1758.)

(*Eutritonium* Cossmann, 1904. Ess. Pal. Comp., 6, p. 123.)

Type species (monotypy) *Murex tritonis* Linné.

Subgenus **AUSTROTRITON** Cossmann, 1903

Austrotriton Cossmann, 1903. Ess. Paleconch., 5, p. 98.

Type species (o.d.) *Triton radialis* Tate.

Charonia (Austrotriton) radialis (Tate)

pl. 2, fig. 11

Triton radialis Tate, 1888. Trans. Roy. Soc. S. Aust., 10, p. 118, pl. 5, fig. 8.

Litorium radiale Tate (sp.), Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 187; Kesteven,

1902, Proc. Linn. Soc. N.S.W., 27 (3), 107, p. 466, pl. 17, fig. 2.

Lampusia radialis Tate, Dennant & Kitson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 107.

Tritonium (Austrotriton) radialis Tate, Cossmann, 1903. Ess. Paleconch., 5, p. 98, pl. 3, figs. 17, 18.

Cymatium radiale Tate, Kesteven, 1912. Proc. Linn. Soc. N.S.W., 37 (1), 145, p. 75.

Diagnosis—Apex of two-and-a-half turns, the nucleus mammillate and eccentric, last half whorl with three biphic spirals on the anterior half. Adult whorls five, sharply angulated anteriorly, the carina broadly and deeply crenulate. Surface sculptured with fine spiral threads, increasing from six on the posterior slope of the earliest whorl to about thirty on the posterior slope of the body whorl. Varices at four-fifths of a whorl with four intervariceal sharp serrations on the posterior carination and three smaller ones on the anterior row on the body whorl, becoming obsolete half-way between the varices.

Dimensions—Height 40, diameter 28, length of aperture and canal 24 mm.

Type Locality—Gastropod bed, R. Murray cliffs, 4 miles south of Morgan, South Australia, Lower Miocene.

Location of Holotype—Tate Mus. Coll., T 462D.

Material—One topotype, Murray cliffs, B.M. Coll., figured hypotype (juvenile), Weymouth's Bore.

Stratigraphical Range—Lower Miocene of Murray cliffs-Dry Creek Sands.

Geographical Distribution—Morgan-Adelaide.

Charonia (Austrotriton) armata (Tate)

pl. 2, figs. 9, 10

Triton armatus Tate, 1888. Trans. Roy. Soc. S. Aust., 10, p. 121, pl. 5, fig. 1.

Triton armatum Tate, 1890. Trans. Roy. Soc. S. Aust., 13 (2), p. 176.

Lampusia armata Tate, 1899, id., 23, p. 104; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), pp. 107, 143.

Austrotriton armatus (Tate), Ludbrook, 1911. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—An *Austrotriton* with a protoconch of apparently two whorls with a small somewhat erect nucleus, the first whorl being irregular in shape and roughened. Adult whorls five, carinated just below the medial line, and sharply nodulose. Varices about every two-thirds of a whorl, between which there are four sharp intervariceal nodulations. Whorls strongly sculptured with about 15 thin spiral lirae per whorl. Body whorl bicarinate at the periphery with the intervariceal nodulations in corresponding rows on each carina. Base with a strong encircling thread equidistant with the two carinae; outer lip expanded, weakly denticulate within. Columella concave with a few weak denticles at the anterior end.

Dimensions—Height 41, diameter 24, length of aperture 13, length of canal 12 mm.

Type Locality—Well-sinking, Tareena, N.S.W.

Location of Holotype—Tate Mus. Coll., T 504.

Observations—This is perhaps the most commonly occurring species of *Charonia (Austrotriton)* in the Dry Creek Sands. One specimen (pl. 2, figs. 9, 10), from Kooyonga Bore, has the protoconch eroded but recognizable.

Material—The figured hypotype F 15193 and 5 specimens Kooyonga Bore, 1 specimen Thebarton Bore, 1 specimen Weymouth's Bore, 1 specimen Tennant's Bore.

Stratigraphical Range—? Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—South-west New South Wales-Adelaide, South Australia.

Subgenus *AUSTROSASSIA* Finlay, 1931

Austrosassia Finlay, 1931. Trans. N.Z. Inst., 62 (1), p. 7.

Type species (o.d.) *Septa parkinsonia* Perry.

Charonia (*Austrosassia*) sp.

Austrotriton woodsi (Tate), Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Observations—Six neanic specimens referred doubtfully to *Austrotriton woodsi* were listed as belonging to that species from Abattoirs Bore. Re-examination shows that although the species is sculptured somewhat similarly to *woodsi*, the protoconch, where preserved, differs entirely from that of *woodsi* and is more likely that of an *Austrosassia*. No adult specimens are available so that the species cannot be fully described or identified.

Order NEOCASTROPODA

Superfamily MURICACEA

Family MURICIDAE

Subfamily MURICINAE

GENUS *TRUNCULARIOPSIS* COSSMANN, 1921

Trunculariopsis COSSMANN, 1921. Rev. Crit. Paleozool., 25 (2), p. 79 (nom. nov.).

(*Truncularia* Monterosato, 1917. Boll. Soc. Zool. Ital. Sci. Series 3, 4, p. 18, non Wiegmann, 1932.)

(*Murithais* Grant and Gale, 1931. Mem. San Diego Soc. Nat. Hist., 1, 12, p. 729.)

Type species (monotypy) *Murex trunculus* Linné.

Trunculariopsis peramangus (Ludbrook)

pl. 2, fig. 16

Murex peramangus Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 95, pl. 5, fig. 24.

Diagnosis—A somewhat small *Trunculariopsis*, with a short spire and a large angulate body whorl with seven varices which are generally only slightly squamose and in the usual form without spines but in the spinose form with two rows of prominent elevated spines on the varices at the shoulder, the lower row of which is covered at the suture, only the upper row showing on the spire whorls. Sculpture of moderate spiral lirae of unequal size, generally alternately strong and weak, crossed by fine, waving, axial lirae and foliaceous growth lamellae. Anterior canal tubular, almost closed, oblique and slightly recurved.

Dimensions—Height 33, diameter 25 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1626.

Observations—In its usual, non-spinose form, this is one of the commonest and most restricted species of the Dry Creek Sands. Two elegant specimens, which at first glance do not appear to be conspecific with the usual form, were recovered from Weymouth's Bore (pl. 2, fig. 6). This appears to be a spinose variety, bearing two rows of spines on the shoulder of the body whorl, the lower row of which is encompassed by the suture in the spire whorls. The sculpture generally is somewhat finer than in the non-spinose form. There seems to be no strong justification for separating the two forms specifically as the degree of variation appears to be typical of the genus and occurs to the same or a greater extent in the type species, *T. trunculus*.

The genus is common in Europe from the Miocene to Recent, and is represented in the living Indo-Pacific fauna.

Material—Four paratypes, Abattoirs Bore; one specimen, Hindmarsh Bore; four specimens, Kooyonga Bore; one specimen, Thebarton Bore; figured hypotype F 15194 and one other specimen (spinose form), Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Genus HEXAPLEX Perry, 1811

Hexaplex Perry, 1811. Conch., pl. 8.
(*Exaplex* Ferussac, 1820. Jour. de Phys., 90, p. 284.)

Type species (s.d. Jousseau, 1879) *Hexaplex foliacea* = *Murex cichoreus* Gmelin.

Subgenus MUREXSUL Iredale, 1915

Murexsul Iredale, 1915. Trans. N.Z. Inst., 47, p. 471.

Type species (monotypy) *Murex octogonus* Quoy & Gaimard.

Hexaplex (Murexsul) suboctogonus sp. nov.

pl. 2, fig. 17

Diagnosis—A typical *Murexsul* with 8 varices on the spire whorls and 9 on the body whorl. Varices foliaceous and carrying short, hollow spines. Whorls spirally sculptured with strong, spiral riblets, 6 on the spire whorls, of which the posterior three are weaker and 12 on the body whorl, six of which over the convex medial portion of the whorl are primary with a weak secondary riblet between each pair and 2 weaker riblets more widely apart on the base.

Description of Holotype—Shell elongate-ovate of moderate size, body whorl about three-quarters height of shell, spire graduated. Protoconch eroded, adult whorls five. Eight wide varices on the spire whorls and nine on the body whorl; varices foliaceous and carrying short, hollow spires. Posterior one-third of each whorl flatly concave, anterior two-thirds convex; posterior portion carrying three weak spiral riblets and anterior portion three or more strong and irregular riblets. Body whorl with but faint spiral sculpture on the posterior concave area; six primary spiral riblets and a secondary riblet between each pair on the convex medial portion and two weaker and more distant riblets on the base. Riblets tend to develop into spines on the varices, particularly on the shoulder of the whorl.

Aperture ovate, crenulated by the spiral sculpture at the margin and with nine fine, sharp elongate denticles within. Inner lip smooth, reflected. Canal of moderate length, nearly closed, oblique and recurved. Umbilicus fairly narrow.

Dimensions—Height 40, diameter 23, length of aperture and canal 25, width of aperture 11 mm.

Type Locality—Kooyonga Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., F 15195.

Observations—It is with considerable hesitation that this shell is separated from the Recent *H. (M.) octogonus* Quoy and Gaimard from New Zealand. The spire is less attenuated in *suboctogonus* and the spire whorls are broader; there are twelve spiral riblets on the body whorl and base in *suboctogonus* and sixteen in *octogonus*. It is possible that *octogonus* represents a migration to New Zealand since Pliocene times or that the two species are an instance of convergence in the adult from distinct lineages. *Suboctogonus* appears to be ancestral to the smaller *H. (M.) umbilicatus* Tenison Woods, uncommon in Southern Australia today; it is, however, closer to *octogonus* than to *umbilicatus* in general appearance.

Material—The holotype only.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Kooyonga Bore, Adelaide.

Hexaplex (Murexsul) biconicus (Tate)

pl. 2, fig. 15

Murex biconicus Tate, 1888. Trans. Roy. Soc. S. Aust., 10, p. 105, pl. 1, fig. 3; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 106; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—An elongate *Murexsul* with a small protoconch of 2 whorls; spire whorls concave posteriorly and slightly convex anteriorly. Eight lamellose

varices per whorl raised into short, sharply-arched scales over the spiral lirae, more conspicuously so on the shoulder of the whorl. Body whorl large, elongate, depressed in the posterior third, convex medially; posterior area less strongly sculptured with about 8 angular lirae; anterior portion with twelve angular lirae, generally alternating with an equal number of secondary lirae. Aperture elongate-ovate, canal of moderate length, oblique, recurved.

Dimensions—Height 34.5, diameter 19, length of aperture 15, width of aperture 10, length of canal 10 mm.

Type Locality—Well-sinking, Tarcena, N.S.W.

Location of Holotype—Tate Mus. Coll., T 426.

Observations—The holotype is a rather young shell, the figured hypotype, typical of adult specimens from Adelaide, has a height of 50 mm., diameter 27 mm. The anterior canal, when fully preserved, is nearly closed in the fully-grown specimen.

Material—The hypotype F 15196 and one younger specimen, Abattoirs Bore; ten neanic specimens, Weymouth's Bore.

Stratigraphical Range—?Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—South-western N.S.W.-Adelaide, S. Australia.

Genus *PTERYNOTUS* Swainson, 1833

Pterynotus Swainson, 1833. Zool. Illust. Ser. 2, 3, p. 100 (not pl. 100 aut.).

(*Pteronotus* Swainson, 1833, *ibid.*, pl. 122, p. 122, non Swainson, 1839.)

(*Pterymurex* Rovereto, 1899. Atti. Soc. Ligust., 10, p. 105.

Type species (monotypy) *Murex pinnatus* Wood.

Subgenus *PTEROCHELUS* Jousseaume, 1880

Pterochelus Jousseaume, 1880. Le Nat., 1 (42), p. 335.

(*Alipurpura* P. Fischer ex Bayle, 1884. Man. de Conch., p. 641.

Type species (monotypy) *Murex acanthopterus* Lamarck.

Pterynotus (Pterochelus) trinodosus (?) (Tate)

pl. 2, fig. 14

Murex trinodosus Tate, 1888. Trans. Roy. Soc. S. Aust., 10, p. 96, pl. 1, fig. 4; Denham & Kelson, 1903. Rec. Geol. Surv. Vic., 1 (2), p. 137.

Murex (Triplex) trinodosus Tate, Harris, 1897. Cat. Tert. Moll. Brit. Mus., 1, p. 178.

Diagnosis—A small trigonal-elongate *Pterochelus* with three varices on each whorl ending posteriorly in a spine, nodulations on the shoulder of each whorl.

Dimensions—Height 20, diameter 8.8, length of aperture and canal 7 mm.

Type Locality—Muddy Creek, Hamilton, Vic.; Kalimnan.

Location of Holotype—Tate Mus. Coll., T 408B.

Material—The figured hypotype F 15197, Weymouth's Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Muddy Creek, Vic.-Adelaide, South Australia.

Genus *HOMOLOCANTHA* Mörch, 1852

Homolocantha Mörch, 1852. Cat. Conch., Yoldi I, p. 95.

Type species (monotypy) *Murex scorpio* Linné.

Homolocantha antecedens sp. nov.

pl. 2, fig. 18

Diagnosis—A *Homolocantha* with a short spine and a body whorl which is very tumid medially, tapering to a long base and lengthy anterior canal. Body whorl with six broad, swollen, lamellose varices, the one at the aperture being broadly alate. Sculpture of strong rather flattened primary riblets with from one to four intermediate secondary riblets. Aperture set low on the shell.

Description of Holotype—Shell of moderate size ovately trigonal, spine short, whorls very convex with six wide lamellose varices per whorl, swollen medially, the varix at the aperture broad and alate. Spiral sculpture of flattened primary riblets, which are stronger on the medial portion of the whorl,

with from one to four intermediate secondary riblets between them, crossed by frequent, fine, waving, scaly, growth lamellae.

Aperture roundly ovate, set very low on the body whorl, anterior canal long, straight, almost closed.

Dimensions—Height 41, diameter 26, height of aperture and canal, including varix, 33, height of aperture (internal) 11, diameter of aperture (internal) 8, length of canal 18 mm.

Type Locality—Tennant's Bore, Salisbury.

Location of Holotype—Tate Mus. Coll., F 15198.

Observations—Although one specimen only of this species has been recovered, it is here described because it resembles very closely two Indo-Pacific species *H. secunda* (Lamarck) and *H. varicosa* (Sowerby), the former from north-west Australia and the latter from Aden. Neither these nor *H. antecedens* are typically *Homolocantha*; all have the spines united into a wing over the whole length of the varix; the three species form a group within *Homolocantha* which might be worthy of subgeneric differentiation when further specimens of typical *Homolocantha* are available. The genus has so far been recorded only from warm Recent seas.

Material—The holotype F 15198 only.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Tennant's Bore, Salisbury, South Australia.

Genus TROPHON Montfort, 1810

Trophon Montfort, 1810. *Conch. Syst.*, 2, p. 482.

(*Muricidea* Swainson, 1840. *Treat. Malac.*, p. 296.)

Type species (monotypy) *Murex magellanicus* Gmelin = *Buccinum geversianum* Pallas.

Subgenus LITIZAMIA Iredale, 1929

Litozamia Iredale, 1929. *Rec. Aust. Mus.*, 17 (4), p. 185.

Type species (o.d.) *Peristernia rudolphi* Brazier.

Trophon (*Litozamia*) *goldsteini* Tenison-Woods

pl. 2, figs. 12, 13

Trophon goldsteini Tenison-Woods, 1876, *Proc. Roy. Soc. Tas.* for 1875, p. 136; Verco, 1895, *Trans. Roy. Soc. S. Aust.*, 19, p. 97, pl. 1, figs. 4, 5; Hedley, 1902, *Proc. Linn. Soc. N.S.W.*, 27, p. 18; Hedley, 1918, *id.*, 51, P.M. 91; May, 1921, *Check List Moll. Tas.*, p. 85; May, 1923, *Ill. Ind.*, pl. 40, fig. 1; Cotton & Godfrey, 1932, *S. Aust. Nat.*, 13 (4), p. 135.

Diagnosis—A fairly large *Litozamia* with six strong, rib-like varices per whorl, sculptured with fine, scarcely raised spiral lirae which do not pass over the varices. Adult whorls angulate and coronate posteriorly, convex anteriorly. Columella arcuate, anterior canal flexuous. Shell with an outer dull, chalky, soft-textured covering which is easily eroded, revealing inner enamel-like shell layer.

Dimensions—Height 16, diameter 8 mm.

Type Locality—Long Bay, Tasmania.

Location of Holotype—Hobart Museum.

Observations—The species has not previously been recorded fossil in South Australia. All specimens (from Abattoirs Bore) are to a greater or lesser extent broken and all are eroded showing the enamel-like inner layer.

Material—Six specimens including the figured hypotype F 15199, Abattoirs Bore; three specimens Recent, South Australia, B.M. Coll.

Stratigraphical Range—Dry Creek Sands-Recent.

Geographical Distribution—New South Wales and southern Australia.

Subgenus ENATIMENE Iredale, 1929

Enatimene Iredale, 1929. *Rec. Aust. Mus.*, 17 (4), p. 185.

Type species (monotypy) *Trophon simplex* Hedley.

Trophon (Enatimene) metungensis (?) Chapman & Crespin

Trophon (Enatimene) metungensis, Chapman & Crespin, 1933, Proc. Roy. Soc. Vic., 46 (1), (n.s.) p. 71, pl. 5, fig. 9; Crespin, 1943, Min. Res. Surv. Bull., 9, p. 99.

Diagnosis—An *Enatimene*, large for the subgenus, with a prominent protoconch of two smooth, inflated whorls. Adult whorls three, somewhat angulate at the shoulder and convex anteriorly, with seven rounded axial costae per whorl, crossed by strong spiral lirae, four on the penultimate and nine on the body whorl, and fine axial growth striae.

Dimensions—Height 14, diameter 6.5, length of aperture 4.2, length of canal 4.5 mm.

Type Locality—No. 1 Bore, Parish of Bumberrah, East Gippsland.

Stratigraphical Range—Kalinian(?) Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Genus BEDEVA Iredale, 1924

Bedeve Iredale, 1924, Proc. Linn. Soc. N.S.W., 49 (3), 197, pp. 193-273.

(*Ergalatax* Iredale, 1931, Rec. Aust. Mus., 18, p. 231.)

(*Widningia* Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 95.)

Type species (o.d.) *Trophon hunleyi* Angas.

Bedeve crassiplicata (Ludbrook)

Widningia crassiplicata, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 95, pl. 5, fig. 25.

Diagnosis—A large *Bedeve*, elongate-fusiform with a high, large paucispiral apex of one-and-a-half smooth turns; adult whorls six, body whorl large. Sculpture of seven plicate axial costae per whorl. Whorls evenly sculptured with numerous spiral lirae, about twelve on the penultimate whorl crossed by numerous crowded imbricating lamellae which undulate sharply backwards and forwards over the lirae and interspaces respectively. Aperture elongate-ovate, anterior canal long, oblique, partially closed when well-preserved, outer lip with two rows of small elongate denticles; umbilical fissure wide in gerontic specimens.

Dimensions—Height 40, diameter 17, length of aperture 12, length of canal 11 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1627.

Observations—After examination of a range of species of *Bedeve* the writer is convinced that this species for which the genus *Widningia* was created is a large *Bedeve*, probably ancestral to the Recent *B. palcae* living in southern Australia, and that *Widningia* should be reduced to synonymy with *Bedeve*.

Material—Holotype and 12 paratypes, Abattoirs Bore, 1 specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Genus TYPLIS Montfort, 1810.

Typhis Montfort, 1810, Conch. Syst., 2, p. 614.

Type species (monotypy) *Murex tubifer* Bruguière.

Subgenus *TYPLIS* s. str.

(*Histolyphis* Jousseaume, 1890, Le Nat., 1 (42), p. 336.)

Typhis (Typhis) laciniatus Tate

Typhis laciniatus Tate, 1888, Trans. Roy. Soc. S. Aust., 10, p. 93, pl. 1, fig. 10; Tate & Deunant, 1893, *id.*, 17 (1), p. 218; Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 171; Deunant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 105; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (6), p. 100; Crespin, 1943, Min. Res. Surv. Bull., 9, p. 99.

Diagnosis—A *Typhis* with a conspicuous protoconch of one-and-a-half smooth, convex whorls and four adult whorls which are gradated, narrow, and flattened posteriorly, with a prominent row of tubular spires on the shoulder. Body whorl subangulate below the suture, with four lamelliform, wing-like adpressed varices with jagged edges alternating with the tubular spines.

Dimensions—Height 11, diameter 4.8, length of aperture and canal 7 mm.

Type Locality—Muddy Creek, Vic.; Miocene.

Location of Holotype—Tate Mus. Coll., T 463B.

Material—2 specimens, Abattoirs Bore. Two topotypes, Muddy Creek, B.M. Coll.

Stratigraphical Range—Miocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Family MAGILIDAE

Genus LATIAXIS Swainson, 1840

Latiaxis Swainson, 1840. *Treat. Malac.*, pp. 82, 306.

Type species (monotypy) *Pyrula mawae* Gray.

Latiaxis dissitus Cotton

Latiaxis dissitus Cotton, 1947. *Rec. S. Aust. Mus.*, 6 (4), p. 667, pl. 21, figs. 9, 10.

Diagnosis—A *Latiaxis* of moderate size with spire depressed below the posterior part of the body whorl; body whorl carinate at the shoulder, the carina being abruptly rounded with a single row of large nodules. Sculpture of close, irregular, wrinkled spirals which are oblique on the posterior portion of the body whorl. Aperture small, narrowly ovate, canal long, almost closed.

Dimensions—Height 40, diameter 33 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—S. Aust. Mus. Coll., P 8327.

Observations—Portion of the body whorl of a second example of this species, based on the unique holotype, was recovered from Kooyonga Bore. The specimen is of the same size as the holotype, which suggests that the holotype may be fully grown, although Cotton considered it "not quite adult" (i.e. p. 667). The species is almost without doubt a *Latiaxis*, of which the type species *L. mawae* Gray is an extreme form. The genus is limited to the Indo-Pacific at the present time.

Material—Fragment, Kooyonga Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Kooyonga Bores.

Superfamily BUCCINACEA

Family PYRENIDAE

Genus MITRELLA Risso, 1826

Mitrella Risso, 1826. *Hist. Nat. Eur. merid.*, 4, p. 247.

Type species (s.d. Cox, 1927) *Murex flaminea* Risso = *scripta* Linnaé.

Subgenus DENTIMITRELLA subg. nov.

Subgeneric Characters—Shell small, elongate-fusiform with a moderately elevated spire about equal to the body whorl. Whorls smooth, suture linear, base ribbed. Protoconch elevated and smooth, of two or more convex whorls. Aperture fairly short and narrow, columella with a flat groove within more or less denticulate, generally where the callus passes over the ribs on the base; outer lip usually varicose, strongly and conspicuously denticulate within. Anterior canal short, rather narrow, oblique.

Type species *Columbella lincolnensis* Reeve.

Observations—The subgenus is created for species such as *lincolnensis* Reeve, *menkeana* Reeve, *austrina* Gaskoin, *pulla* Gaskoin, *bidentata* Menke, *semiconvexa* Lamarck, *rosacea* Reeve, *yorkensis* Crosse, and *tayloriana* Reeve, and the fossil species *muscula* Ludbrook, which in South Australia were lately classified under *Zemitrella*. The South Australian group differs markedly from the New Zealand *Zemitrella*, which is typically spirally ribbed, has a broader aperture with a widely open anterior canal, and is without the denticulations on the outer lip which are generally strong and conspicuous in the South Australian

species. In this respect the group for which *Dentimitrella* is created appears closest to the subgenus *Atilia* (type species *Columbella suffusa* Sowerby) which has a smooth columella and is typically axially costate.

The related subgenus *Ademitrella* was introduced by the writer for a similar shell lacking the denticulations of the outer lip and having a protoconch of a different type.

Mitrella (*Dentimitrella*) *lincolnensis* (Reeve)

pl. 3, fig. 5

Columbella lincolnensis Reeve, 1859, Conch. Icon., 11, pl. 29, figs. 184 a, b; May, 1921, Check List Moll. Tas., p. 83; May, 1923, Ill. Ind., pl. 36, fig. 25; Cotton & Godfrey, 1932, S. Aust. Nat., 13 (3), p. 100.

Zemitrella lincolnensis Reeve, Cotton & Godfrey, 1938, Mal. Soc. S. Aust., 1, p. 23; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Zemitrella menkiana Reeve, Ludbrook, *ibid.*

Diagnosis—A slender *Dentimitrella* of moderate size with an elevated, smooth protoconch of three convex turns; adult whorls six, gradually increasing, sides flat, suture linear. Body whorl about half height of shell, aperture short; narrow with a short, rather narrow, oblique anterior canal. Outer lip with seven conspicuous denticles. Columella elongately S-shaped with six denticles on the callus at the position of the lirae on the base. Body whorl much constricted at the base, with about eight spiral lirae on the base; lirae pass a short distance on to the columella at the position of the denticles on the callus and then abruptly terminate.

Dimensions—Height 10.5, diameter 3.5, height of body whorl 6, height of aperture 3.5 mm.

Type Locality—Port Lincoln, South Aust.; Recent.

Location of Holotype—B.M. Coll.

Location of Hypotype—Tate Mus. Coll., F 15400.

Observations—The species is not uncommon as a fossil in the Dry Creek Sands and has appeared in almost all the borings under present consideration. The specimens previously classified as *Zemitrella menkiana* are merely somewhat stouter examples of *lincolnensis*.

Material—Holotype and one topotype; the figured hypotype, Abattoirs Bore; 9 specimens, Abattoirs Bore; 11 specimens, Hindmarsh Bore; 5 specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands—Recent.

Geographical Distribution—Southern Australia and Tasmania.

Mitrella (*Dentimitrella*) *muscula* (Ludbrook)

Zemitrella muscula Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 96, pl. 5, fig. 12.

Diagnosis—A very small, bluntly fusiform solid *Dentimitrella*; with a protoconch of one-and-a-half small globose, smooth turns; adult whorls four, body whorl somewhat swollen. Suture well impressed, somewhat canalliculate. Whorls smooth except for from six to ten incised striae at the base. Outer lip with five conspicuous denticles, somewhat flexuous notched above, at first expanded and then inflected below.

Dimensions—Height 4.2, diameter 2 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1657.

Observations—The very small species with its somewhat swollen body whorl occurs in small numbers in most of the bores under present study. The shell is solid in appearance and has a characteristically rugged appearance to the outer lip. Abattoirs Bore specimens on which the species was based are somewhat eroded and the diagnosis has been amended from a well-preserved specimen from Hindmarsh Bore.

Material—Four paratypes, Abattoirs Bore; one specimen, Hindmarsh Bore; three specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Mitrella (Dentimitrella) sp.

Zemitrella cf. *tayloriana* (Reeve), Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Observations—A single specimen from Abattoirs Bore was previously compared with *tayloriana* (Reeve). It has now been compared with the holotype and is seen to be specifically distinct. The spire is narrowly attenuated and the protoconch more elevated.

Description of the species is deferred until further material is available.

Subgenus ADEMITRELLA Ludbrook, 1941

Ademitrella Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 96.

Type species (monotypy) *Ademitrella insolentior* Ludbrook.

Mitrella (Ademitrella) insolentior (Ludbrook)

Ademitrella insolentior Ludbrook, 1941. Trans. Roy. Soc. S. Aust., 65 (1), p. 106, pl. 5, fig. 11.

Diagnosis—A small *Ademitrella* with a fairly short spire and a long aperture. Protoconch subconical, pointed, consisting of one-and-a-half smooth turns, of which the first is small and the tip eccentric. Adult whorls four, flatly convex, body whorl long and compressed at base. Aperture elongate; both outer lip and columella smooth.

Dimensions—Height 6.2, diameter 2.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1669.

Observations—The strong teeth which characterize species of *Dentimitrella* are absent in this species of *Ademitrella*, so far unique, which, except for one specimen from Hindmarsh Bore with a slight ridge within the lip, has no denticles within the outer lip. The protoconch, which is pointed with an eccentric apex, is unlike that of any species of *Dentimitrella*.

Material—Two topotypes, Abattoirs Bore; 2 specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Family BUCCINIDAE

Genus Phos Montfort, 1810

Phos, Montfort, 1810. Conch. Syst., 2, p. 494.

(*Rhinedomus*, Swainson, 1840. Treat. Malac., p. 80.)

(*Rhinedomus*, Swainson, 1840. Treat. Malac., p. 305.)

Type species (monotypy) *Murex senticosus* Linné.

Subgenus *Phos* s. str.

***Phos gregsoni* Tate**

pl. 2, figs. 7, 8

Phos gregsoni Tate, 1888, Trans. Roy. Soc. S. Aust., 10, p. 168, 1889, id., 11, pl. 4, fig. 5; Denmant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 137; Cressin, 1943, Min. Res. Surv. Bull., 9, p. 98.

Diagnosis—A typical *Phos* of moderate size, with a high multispiral protoconch of $3\frac{1}{2}$ smooth turns, followed by a half turn with four brephic axials. Adult whorls 8, strongly and sharply sculptured with eight axial plicae per whorl sharply tuberculate at the angle of the whorl in the last three whorls, axial sculpture crossed by frequent strong primary lirae with secondary lirae between. On the body whorl six conspicuous bands surmounted by the lirae on the anterior two-thirds, but absent on the concave posterior one-third. Three equal lirae on each band and from four to five lirae on the interspaces. Aper-

ture with a very short anterior canal, strongly recurved; outer lip with about eight long denticles within.

Description of Hypotype (Hindmarsh Bore)—Shell of moderate size for the genus, thick, strong, elongate, fusiform, spire elevated. Protoconch damaged in the hypotype, adult whorls eight, strongly angled at the posterior one-third. No varices on the earliest whorls, but one varix per whorl on the last three whorls. Sculpture of prominent, sharp axial plicae, eight per whorl, sharply tuberculate on the angle of the whorl, dying out on the concave posterior third, but persisting with nearly consistent strength to the shoulder and dying out on the base of the body whorl. Axial sculpture crossed by strong primary spiral lirae with weaker secondary lirae between; about 14 primary lirae on the penultimate whorl. Body whorl with six conspicuous bands surmounted by lirae on the anterior two-thirds, but absent on the posterior third; three equal lirae on each band and from three to five lirae on the interspaces. Aperture subovate, angulate posteriorly and produced into a short and sharply recurved canal anteriorly. Outer lip with a varix behind and eight long denticles within. Columella twisted, without denticles, but with a faint groove at the anterior edge.

Dimensions—Height 28.5, diameter 16.5, height of aperture and canal (oblique measurement) 15 mm.

Hypoparatype F 15402—A juvenile with protoconch intact. *Protoconch* (pl. 2, fig. 8a) high, multispiral, of four turns of which the first $3\frac{1}{2}$ are smooth and shining, the last half bearing brephic axials.

Dimensions of Holotype (Tate)—Height 9, diameter 8.5, length of canal and aperture 8.5 mm.

Type Locality—Jemmy's Point, Gippsland, Vic., Kalimnan.

Location of Holotype—Tate Mus. Coll., T 594C.

Locality of Hypotypes—Hindmarsh Bore, Adelaide, 450-487 ft.

Location of Hypotypes—Tate Mus. Coll., F 15401, F 15402.

Observations—This typical *Phos* is very close indeed to the type species *P. (P) senticosus* from the Philippines which seems to grow to a larger size than *P. (P) gregsoni*. Adelaide specimens of *gregsoni* are larger and broader than those from the type locality and are sculptured similarly to *Charonia (Austrosassia) tortirostris* (Tate); they are recognizable by the short anterior canal and high multispiral protoconch.

Material—Hypotype and hypoparatype, three juvenile specimens Hindmarsh Bore. One specimen each from Thebarton Bore, Tennant's Bore; four juveniles Abattoirs Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Family NASSARIIDAE

Genus HINIA Gray, 1847

Hinia Gray ex Leach, 1847. Ann. Mag. Nat. Hist., 20, p. 269.

(*Hina* Leach, 1852. Syn. Moll. Grt. Brit., p. 123.)

Type species (s.d. Cossmann, 1901) *Buccinum reticulatum* Linné.

Subgenus RETICUNASSA Iredale, 1936

Reticunassa Iredale, 1936, Rec. Aust. Mus., 19 (5), p. 322.

Type species (s.d.) *Nassa paupera* Gould.

Hinia (Reticunassa) subcopiosa sp. nov.

pl. 3, fig. 1

Nassa tatei T. Woods, Tate, 1890a, Trans. Roy. Soc. S. Aust., 13 (2), p. 176; Demant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 143.

Nassarius tatei T. Woods, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small *Reticunassa* with a prominent protoconch of three smooth convex turns followed by a half turn with brephic axials. Adult whorls

four, sculptured with prominent axial costae increasing from twelve on the first to 18 on the penultimate and body whorls crossed and tuberculated by four flat, spiral cords about equal to the interspaces on each whorl; body whorl with 10 spirals on the whorl and 5 closely set and less sharply defined spirals on the base.

Description of Holotype—Shell small, ovate, with conical spire; protoconch prominent and moderately elevated of three smooth convex turns followed by a half turn with brephic axials; adult whorls four, moderately convex, sculptured with prominent axial costae, increasing from 12 on the first to 18 on the penultimate and body whorls, which are crossed and tuberculated by four flat, spiral cords, about equal to the interspaces on each whorl; body whorl with 10 spirals on the whorl and 5 closely set and less sharply defined spirals on the base. Suture impressed. Aperture subovate, angled above and channelled below; outer lip varicose, somewhat sinuous in profile, with 8 denticles within. Columella arcuate, inner lip reflected over columella with seven denticles, those at the anterior and posterior ends being more strongly developed; columella with an anterior plait.

Dimensions—Height 8, diameter 4 mm.

Type Locality—Hindmarsh Bore, 459-487 ft.

Location of Holotype—Tate Mus. Coll., F 15403.

Observations—The sculpture of *R. (R) subcopiosa* is distinct from that of *H. (R) tatei* with which it has previously been identified. The spirals on *H. (R) tatei* are more numerous and narrower than the interspaces; the whorls are more convex and the protoconch, although of the same type, is broader and larger than that of *H. (R) subcopiosa*.

Material—Holotype and numerous paratypes Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Hinia (Reticunassa) spiraliscabra (Chapman and Gabriel)

pl. 3, fig. 2

Nassa spiraliscabra Chapman & Gabriel, 1914, Proc. Roy. Soc. Vic., 26 (2) (n.s.), p. 325, pl. 28, fig. 34; 1916, Rec. Geol. Surv. Vic., 3 (4), pl. 71, fig. 34.

Nassarius spiraliscabrus Chapman & Gabriel, Chapman, Crespin & Keble, 1928, Rec. Geol. Surv. Vic., 5 (1), p. 164; Crespin, 1943, Lin. Res. Surv. Bull., 9, p. 98.

Diagnosis—A small *Reticunassa* with a prominent apex of three smooth turns, the first very small, followed by a half turn with brephic axials. Adult whorls four, sculptured with about 20 narrow and rather sharp costae per whorl, slightly tuberculated posteriorly, and crossed by conspicuous spiral striae, five on the penultimate whorl and about 15 on the body whorl becoming closer towards the base, where there are about 10 narrow and crowded threads. Outer lip varicose slightly flexuous in profile, denticulate within; columella arcuate, with a long denticle at the posterior and anterior and an anterior plait.

Dimensions—Height 10.5, diameter 5.25 mm.

Type Locality—Mallee bore No. 8, Western Victoria, 199-209 ft.

Location of Holotype—Vic. Mines Dept. Coll.

Location of Hypotype—Tate Mus. Coll., F 15404.

Material—About sixty examples, many of which are neanic, Weymouth's Bore; 12 examples Abattoirs Bore.

Stratigraphical Range—? Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Family FASCIOLARIIDAE

Subfamily FASCIOLARIINAE

Genus FASCIOLARIA Lamarck, 1799

Fasciolaria Lamarck, 1799, Mem. Soc. Hist. Nat., Paris, p. 73.

Type species (monotypy) *Murex tulipa* Linné.

Subgenus *PLEIA* Finlay, 1930

Pleia Finlay, 1930. Trans. N.Z. Inst., 61, p. 60.

Type species (o.d.) *Fasciolaria decipiens* Tate.

Fasciolaria (*Pleia*) sp.

Specific Characters—A neanic specimen with a large paucispiral, smooth protoconch of one-and-a-half turns and four adult whorls sculptured with 12 axial plicae per whorl, crossed by spiral threads which are weaker in the concave posterior third of the whorl where they are from 3 to 8 in number, and stronger, generally alternately primary and secondary over the convex anterior two-thirds, where they number about ten.

Aperture subovate, angled posteriorly and anteriorly. Outer lip thin, crenulated by the spiral sculpture and denticulated within by the spiral threads. Columella arcuate, with two plaits at the base. Anterior canal long, narrow, gently recurved.

Observations—The single specimen obtained from Weymouth's Bore is not described in full in view of its juvenile state. It appears to be closest to *F. concinna* Tate, and may possibly belong to that species which, however, has a longer and more acuminate spire.

Subfamily *FUSININAE*

Genus *FUSINUS* Rafinesque, 1815

Fusinus Rafinesque, 1815. Analyse, p. 145, n.n. for *Fusus* Lamarck.

(*Fusus* Bruguière, 1789. Ency. Meth. (Vers), 1, non Helbling, 1779.)

Type species (s.d. Children, 1823) *Murex colus* Linné.

Subgenus *FUSINUS* s. str.

(*Exilifusus* Gabb, 1876. Proc. Acad. Nat. Sci., Philad., p. 278, non Conrad, 1865.)

(*Pseudofusus* Monterosato, 1884. Nom. Conch. Medit., p. 117.)

Fusinus (*Fusinus*) *dictyotis* Tate

Fusus dictyotis Tate, 1888, Trans. Roy. Soc. S. Aust., 10, p. 135, pl. 7, figs. 2, 6; Tate & Denmant, 1893, *id.* 17 (1), p. 219; 1895, *id.* 19 (1), p. 111; 1897, Cat. Tert. Moll. Brit.

Mus., 1, p. 132; Denmant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 102.

Fusinus dictyotis Tate, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—An elongate *Fusinus* with a high gradated spire and more or less angulated whorls. Protoconch of two globose turns and several adult whorls in a height of 82 mm. Whorls with about seven axial plicae per whorl, generally angulate at the shoulder, crossed by alternately primary and secondary spiral lirae of which there are about 6 on the posterior portion and 7 on the anterior portion of the whorl, including the two keels.

Dimensions—Height 82, diameter 24, height of aperture 16, width of aperture 11, length of canal 35 mm.

Type Locality—Schnapper Point, Vic.; Miocene.

Location of Holotype—Tate Mus. Coll., T 480A.

Material—Several broken specimens, Abattoirs Bore; one specimen with body whorl incomplete, Weymouth's Bore; two specimens, Muddy Creek, Vic., B.M. Coll., No. C 9435; one specimen (of var.) Table Cape, Tas., B.M. Coll., No. C 39747.

Stratigraphical Range—? Oligocene-Dry Creek Beds.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Superfamily *VOLUTACEA*

Family *OLIVIDAE*

Subfamily *OLIVINAE*

Genus *OLIVELLA* Swainson, 1831

Olivella Swainson, 1831. Zool. Illust. ser. 2, 2 (13), pl. 58.

Type species (s.d. Dall, 1909) *Oliva purpurata* Swainson = *Oliva dama* Mawe.

Subgenus CUPIDOLIVA Iredale, 1924

Cupidoliva Iredale, 1924. Proc. Linn. Soc. N.S.W., 49 (3), 197, pp. 183, 259.

Type species (o.d.) *Olivella nympha* Adams & Angas.

Olivella (*Cupidoliva*) *nymphalis* (Tate)

pl. 3, fig. 3

Olivella nymphalis Tate, Dennant, 1889. Trans. Roy. Soc. S. Aust., 11, p. 43 (nom. nudum).

Olivella nymphalis Tate, 1889, *ibid.*, p. 145, pl. 7, fig. 7.

Olivella nymphalis Tate, Cossmann, 1889b, *Annuaire Geol. Univ.*, 5, p. 1090; Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 72; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 137; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100; Cressin, 1943, Min. Res. Surv. Bull., 9, p. 98.

Diagnosis—A *Cupidoliva* of moderate size with a small subglobose protoconch followed by four adult whorls which overlap the canaliculate suture. Body whorl large, rather narrow with a spiral sulcus near the middle of it and a spiral striation at the anterior one-quarter. Columella with three close-set plicae at the anterior end.

Description of Hypotype (Muddy Creek)—Shell elongate-ovate with a small subglobose protoconch of one turn. Adult whorls four, flatly convex, overlapping at the canaliculate suture. Body whorl large, three-quarters total height of shell, gently convex with a medial narrow spiral sulcus and a spiral striation at the anterior one-quarter. Aperture elongate, outer lip somewhat inflexed posteriorly and slightly flexuous in profile. Columella gently arcuate, with three close-set folds at the anterior end.

Dimensions—Height 10.5, diameter 4, height of body whorl 7.5, height of aperture 6 mm.

Type Locality—Gippsland (? Jemmy's Point), Vic.; Kalimnan.

Location of Holotype—Tate Mus. Coll., T 616C.

Observations—No further examples of the species have been found since it was recovered from Abattoirs Bore. The species has not previously been completely described.

Material—The hypotype (B.M. Coll., C 39650) and nine specimens C 39651-4, C 9368, B.M. Coll., 39 specimens Abattoirs Bore.

Stratigraphical Range—Miocene (Bairnsdale substage)—Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.—Adelaide, South Australia.

Genus ANCILLA Lamarck, 1799

Ancilla Lamarck, 1799. Mem. Soc. d'Hist. Nat., Paris, p. 70.

Type species (monotypy) *Voluta basi constricti* Martini = *Voluta ampla* Gmelin.

Subgenus BARYSPIRA P. Fischer, 1885

Baryspira P. Fischer, 1885. Man. de Couch., p. 600.

Type species (s.d. Finlay, 1927) *Ancilla australis* Sowerby.

Ancilla (*Baryspira*) *tatei* Marwick

pl. 3, fig. 4

Ancillaria mucronata Sowerby, Tenison-Woods, 1876, Proc. Roy. Soc. Tas. for 1875, p. 17; Johnston, 1877, *id.* for 1876, pp. 83, 86; Johnston, 1888, Geol. Tas., pl. 31, fig. 12; Tate, 1885, Proc. Roy. Soc. Tas. for 1884, p. 208.

Ancillaria hebra Hutton, Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 147, pl. 7, fig. 5; Tate & Dennant, 1893, Trans. Roy. Soc. S. Aust., 17 (1), p. 220.

Ancilla pseudaustralis var. Tate, *ibid.*, p. 148, pl. 6, fig. 13.

Ancillaria pseudaustralis Pritchard, 1896, Proc. Roy. Soc. Vic., 8 (n.s.), p. 104.

Ancilla hebra Hutton (sp.), Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 76; Tate, 1899a, Trans. Roy. Soc. S. Aust., 23 (1), p. 108; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), pp. 99, 137; Chapman, 1916, Rec. Geol. Surv. Vic., 3 (4), p. 378.

Ancilla tatei Marwick, 1924, Aust. A.A.S., 16, p. 319, pl. 5, fig. 3.

Baryspira tatei Marwick, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Ancilla hebra (Tate), Cressin, 1943, Min. Res. Surv. Bull., 9, p. 95.

Diagnosis—A *Baryspira* of moderate size. Aperture a little more than half height of shell, fairly broad posteriorly and not projecting beyond the columella

anteriorly. Columellar callus ascending from the middle of the inner lip vertically to nearly the top of the body whorl where it spreads on to the spire callus and forms a thin pad. Basal portion of columella long with five basal spirals set at a high angle.

Description of Hypotype—Shell of moderate size with a short, thick spire bluntly rounded at the apex. Aperture a little more than half height of shell, fairly broad, elongate-ovate, gradually narrowing posteriorly and fairly wide anteriorly where it does not project beyond the columella. Columella broadly angulate, basal portion long, with five basal spirals which are set at a high angle. Spire covered with thick callus, more or less punctate; columellar callus ascending from the middle of the inner lip vertically to nearly the top of the body whorl where it spreads on to the spire callus, forming a thin pad.

Base with three spiral grooves, the lower two covered by the basal callus, which extends upward to the limit of the median spiral. Body whorl where not calloused with frequent axial striae.

Dimensions—Height 30, diameter 13 mm.

Locality—River Murray Cliffs, 4 miles south of Morgan. Lower Miocene.

Location of Hypotype—B.M. Coll., G 9376.

Dimensions of Holotype (Marwick, 1924)—Height 17, diameter 7 mm.

Type Locality—Muddy Creek, Vic.; Miocene.

Location of Holotype—Nat. Mus., Melbourne.

Observations—The only Adelaide specimens available are a broken juvenile from Weymouth's Bore and a worn gerontic specimen from Thebarton Bore. This species has not previously been completely described, although Marwick in separating it from the New Zealand *A. heberti* pointed out its diagnostic features. In view of the condition of the Weymouth's Bore specimen, selection of a hypotype has been made from material in the British Museum. The subgenus occurs in the European Tertiary and in the Indo-Pacific, Australian and New Zealand Regions in Recent times. It would appear to have reached Australia in the early mid-Tertiary.

Material—One broken juvenile, Weymouth's Bore; the hypotype and three other specimens G 9376, R. Murray Cliffs, B.M. Coll.; 9 specimens G 39825-9, Table Cape, B.M. Coll.

Stratigraphical Range—?Oligocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Subgenus *TURRANCILLA* Martens, 1903

Turrancilla Martens, 1903, Wiss. Ergebn. dtsch. Tiefsee Exped., 7 (1), p. 119.

Type species (monotypy) *Ancilla* (*Turrancilla*) *lanceolata* Martens.

Ancilla (*Turrancilla*) *adelaidensis* sp. nov.

pl. 3, fig. 9

Ancilla pseudaustralis Tate, 1890a, Trans. Roy. Soc. S. Aust., 13 (2), p. 170; Denham & Kitchin, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 142.

Buryspira pseudaustralis Tate, Lindbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small *Turrancilla* with a rather blunt apex. Body whorl three-fifths height of shell. Aperture elongate, only moderately broad, narrowing gradually posteriorly and slightly anteriorly. Columella gently concave with a thin callus ascending nearly vertically to join the spire callus, almost vertical anteriorly with several narrow folds set at a high angle.

Description of Holotype—Shell small, elongate-ovate, with a fairly high spire terminating in a blunt apex. Spire covered with thin callus. Body whorl three-fifths height of shell, moderately convex. Aperture elongate-ovate, moderately broad, narrowing gradually posteriorly and slightly anteriorly, not projecting beyond the columella. Columella slightly concave with a thin callus, ascending nearly vertically to join the spire callus, almost vertical anteriorly

with about five narrow folds set at a high angle. Base with three spiral grooves, covered with callus to the medial groove. Body whorl where not calloused with numerous fine axial striae.

Dimensions—Height 9, diameter 3.5, height of body whorl 6.5, height of aperture 5, width of aperture 1.5 mm.

Type Locality—Weymouth's Bore, 310-330 ft.

Location of Holotype—Tate Mus. Coll., F 15405.

Observations—This small species is not *Ancilla pseudaustralis* ("dwarfed", Tate l.c., p. 176), a large Miocene species, more tumid in shape. It is somewhat like *Ancilla semilaevis* Tenison-Woods, which has a more attenuated spire with constrictions on the suture and a very thin spire callus. The holotype is not fully grown, a larger broken example from Weymouth's Bore reaches dimensions, height 12.5, diameter 4.5 mm.

Material—Holotype, 14 paratypes Weymouth's Bore; 2 paratypes Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Family MITRIDAE

Subfamily VEXILLINAE

GENUS AUSTRMITRA Finlay, 1927

Austrmitra Finlay, 1927, Trans. N.Z. Inst., 57, p. 410.

Type species (o.d.) *Columbella rubiginosa* Hutton

Austrmitra angusticostata Ludbrook

Austrmitra angusticostata Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 96, pl. 5, fig. 13.

Diagnosis—A small, rather narrow *Austrmitra* with a conspicuous protoconch of one-and-a-half smooth convex turns followed by five adult whorls sculptured with prominent narrow axial costae sharply arcuate in the posterior half, about 12 but slightly variable in number. Columella with four sharp and stout plicae; base with six spiral lirae.

Dimensions—Height 8, diameter 3 mm.

Type Locality—Abattoirs Bore; Pliocene.

Location of Holotype—Tate Mus. Coll., T 1655.

Observations—Wenz (1941, p. 1285) has placed *Austrmitra* in synonymy with *Peculator* Iredale as a subgenus of *Pusia* Swainson. While agreeing that *Peculator* is comparable with *Pusia* and is perhaps subgeneric to it, the writer considers that *Austrmitra* belongs to a different stock and should be separated generically from both *Pusia* and *Peculator*. It is well represented in the Australian and New Zealand late Tertiary and Recent, and is represented in the Indo-Pacific by *capensis* Dunker, *turriger* Reeve, *kowiensis* Sowerby, *capricornia* Hedley.

Material—14 paratypes, Abattoirs Bore; 3 specimens Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores.

Austrmitra mawsoni sp. nov.

pl. 3, fig. 6

Austrmitra schomburgki (Angas), Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small elongate *Austrmitra* with a fairly high spire. Protoconch elevated, of one-and-a-half nearly straight turns, nucleus eccentric, small, sides nearly flat. Adult whorls sculptured with twelve axial ribs per whorl, only slightly arcuate and alternating from whorl to whorl; ribs wider than interspaces and broadening from posterior to anterior. Columella with four oblique plaits.

Description of Holotype—Shell small, elongate-ovate, rather narrow, spire fairly high. Protoconch elevated, of one-and-a-half smooth turns with a small eccentric nucleus and nearly flat sides. Adult whorls four, sculptured with twelve axial ribs per whorl, only slightly arcuate and alternately disposed from whorl to whorl; ribs wider than interspaces and broadening from posterior to anterior; both ribs and interspaces finely axially striate. Suture impressed, scalloped by the ribs. Body whorl small, with ribs increasing in frequency but decreasing in strength towards the aperture. Base constricted with about eight spiral striae. Aperture elongate-ovate; outer lip inflexed posteriorly, convex in profile; columella gently oblique with four strong oblique folds.

Dimensions—Height 8, diameter 3.3, height of body whorl 5 mm.

Type Locality—Weymouth's Bore, 310-330 ft.

Location of Holotype—Tate Mus. Coll., F 15406.

Observations—Previously identified with the Recent *A. schomburgki* (Angas) this species differs in having a protoconch which is high and straight-sided; the protoconch of *A. schomburgki* is flat and the tip is immersed. *A. schomburgki* is a more tumid shell. In other respects the two species are very similar.

The species is named in honour of Sir Douglas Mawson, Emeritus Professor of Geology in the University of Adelaide.

Material—The holotype and 9 paratypes, Weymouth's Bore; 13 paratypes, Hindmarsh Bore; 3 paratypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Austromitra pauciplicata sp. nov.

pl. 3, fig. 7

Austromitra scalariformis (T.-Woods), Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small *Austromitra* with a prominent protoconch of one-and-a-half turns, the nucleus small and eccentric, sides nearly flat. Adult whorls five, sculptured with 9 to 10 axial costae per whorl; ribs generally narrower than interspaces, but widening from posterior to anterior. Body whorl rather small. Columella with three strong and a fourth weak anterior plait. Outer lip with about 10 long, weak denticles far within.

Description of Holotype—Shell small, elongate-ovate, rather narrow, spire high. Protoconch moderately prominent of one-and-a-half smooth turns with a small eccentric nucleus, the sides nearly flat. Adult whorls five, sculptured with 9 axial costae per whorl; ribs prominent and thick, particularly in the early whorls, generally narrower than the interspaces and somewhat increasing in width from posterior to anterior. Suture impressed, gently undulating. Body whorl small, ribs decreasing in strength towards the aperture; base constricted, with 10 strong spiral lirae. Aperture elongate-ovate; outer lip slightly expanded medially, inflexed posteriorly and bearing about 10 weak elongate denticles far within. Columella slightly arcuate with three strong plaits and a fourth weak anterior plait.

Dimensions—Height 8, diameter 3, height of body whorl 5 mm.

Type Locality—Abattoirs Bore.

Location of Holotype—Tate Mus. Coll., F 15407.

Observations—Although in several respects this species resembles *A. scalariformis* with which it was previously identified, it has fewer axial costae per whorl; *A. scalariformis* has twelve. The protoconch is rather less prominent than in *A. scalariformis*.

Material—Holotype and two paratypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore.

***Austromitra multiplicata* sp. nov.**

pl. 3, fig. 8

Diagnosis—A small *Austromitra* with a high spire. Protoconch elevated, pointed, of one-and-a-half smooth turns with a small eccentric nucleus. Adult whorls five, sculptured with 16 slightly oblique axial costae per whorl, about equal to the interspaces. Costae of equal width over the whorl and converging on the constricted base of the body whorl. Aperture rather narrow; outer lip with about 10 long denticles within; columella somewhat flexuous, with three strong and a fourth weak anterior plait.

Description of Holotype—Shell small, elongate-ovate, rather narrow, with a high spire. Protoconch elevated, pointed, of one-and-a-half smooth turns with a small eccentric nucleus. Adult whorls five, sculptured with 16 axial costae per whorl, extending evenly from suture to suture, about equal to interspaces, slightly oblique, converging on the constricted base of the body whorl. Aperture oblique, rather narrow, outer lip oblique to the right in profile, with about 10 long denticles, fairly deeply within. Columella somewhat flexuous with three strong plaits and a weaker fourth anterior plait. Base constricted, with about 10 irregular spiral lirae.

Dimensions—Height 8.5, diameter 3, height of body whorl 5 mm.

Type Locality—Weymouth's Bore, 310-330 ft.

Location of Holotype—Tate Mus. Coll., F 15408.

Observations—The species is readily distinguishable by the more frequent axial costae which extend evenly over the whole of each whorl.

Material—Holotype and 2 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Subfamily MITRINAE

Genus MITRARIA Rafinesque, 1815

Mitraria Rafinesque, 1815, Analyse, p. 145, n.n. for *Mitra* Lamarck, 1798,
(*Mitra* Lamarck, 1798, Ency. Meth. (Vers.), Tabl. 2, pl. 369, non Martyn, 1784.)
(*Papalaria* Dall, 1915, Bull. U.S. Nat. Mus., 90, p. 60.)

Type species (s.d. Children, 1823) *Voluta episcopalis* Linné.

Subgenus EUMITRA Tate, 1889

Eumitra Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 135.

(*Vicimitra* Iredale, 1929b, Aust. Zool., 5, p. 343.)

Type species (here designated) *Mitra alokiza* Tenison Woods.

***Mitraria (Eumitra) glabra* (?) (Swainson)**

Mitra glabra Swainson, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Observations—Three broken specimens referred to this species were recorded from Abattoirs Bore. Identity cannot be established on the material, and the specific name should be regarded as tentative only until better material can be obtained.

***Mitraria (Eumitra) coxi* sp. nov.**

pl. 6, fig. 4

Diagnosis—A fairly large *Eumitra*, rather broad, with a comparatively short aperture. Protoconch small and rather flattened, of one-and-a-half smooth turns. Adult whorls six, smooth but for growth striae; body whorl large, gently convex and subangulate at the shoulder; base constricted with faint converging growth lines. Suture impressed. Aperture rectangularly elongate, angulate posteriorly; outer lip and columella nearly parallel over most of their length; outer lip nearly vertical in profile; columella slightly oblique, with five plaits.

Dimensions—Height 61.5, diameter 17, height of body whorl 36, height of aperture 25 mm.

Type Locality—McDonald's Bank, Muddy Creek, Victoria, upper beds.

Location of Holotype—B.M. Coll., G 39670.

Observations—At first glance this species might appear to be a smooth form of *M. (E.) alokiza* (Tenison-Woods). It is, however, stouter than *alokiza*, the spire is shorter, and although the body whorl is of the same length the aperture is shorter. The holotype and one paratype in the B.M. Collection from Muddy Creek and both without spiral sculpture; Adelaide specimens are sometimes faintly and distantly marked with punctate spiral striae. The species is named in honour of Dr. L. R. Cox, F.R.S., of the British Museum (Natural History).

Material—Holotype G 39670, paratype G 39669, B.M. Coll., Muddy Creek, Victoria; one paratype Kooyonga Bore; one paratype Thebarton Bore; six paratypes Abattoirs Bore.

Stratigraphical Range—Kalinman-Dry Creek Sands.

Geographical Distribution—Muddy Creek, Western Victoria, Adelaide, South Australia.

Mitraria (?*Eumitra*) sp.

Mitra rhodia(?), Reeve, Ladbroke, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Observations—Two possibly juvenile specimens from Abattoirs Bore were doubtfully referred to *M. rhodia* Reeve. These are certainly not juveniles of *M. rhodia* and are only doubtfully *Eumitra*.

Mitraria (*Eumitra*) *diductua* (Tate)

pl. 4, figs. 3, 6

Mitra dictua Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 138 (pars), pl. 4, fig. 9, non Tate-Woods.

Mitra diductua Tate, 1899, Trans. Roy. Soc. S. Aust., 23 (1), p. 108.

Mitra fodinalis Tate, 1899, *ibid.*

Diagnosis—A fairly large *Eumitra*, moderately broad. Protoconch small and flattened with tip immersed, of two turns the first small and flat, the second rapidly expanding. Adult whorls eight, strongly impressed at the suture, very slightly convex in profile. Sculpture variable but generally almost smooth on the whorls except for thin spiral threads on the shoulder, faint axial growth striae and microscopic spiral striae with about 20 strong spiral ridges. Columella with one or two weak anterior folds.

Description of Holotype—Shell elongate-fusiform, solid, spire shorter than body whorl, aperture of moderate height. Protoconch small and flattened, of two turns, tip immersed; first whorl very small and narrow, the second rapidly expanding and fairly high. Adult whorls seven, suture deep and strongly impressed, somewhat irregular. Whorls smooth except for about four spiral threads on the shoulder, microscopic spiral striae and faint axial growth lines. Base constricted, about 20 strong spiral ridges extending fairly evenly over base and canal. Columella slightly arcuate, with one strong posterior fold and two weak anterior folds. Outer lip broken.

Dimensions—Height 55, diameter 15.6, height of body whorl 34, height of aperture 22 mm.

Type Locality—Well-sinking Tareena, N.S.W. ("Murray Desert").

Location of Holotype—Tate Mus. Coll., T 638.

Paratype—Tate's original tablet contains a second specimen, larger and more complete than the holotype. The aperture is rectangularly elongate, with the outer lip and columella nearly parallel over most of their length. Outer lip almost vertical in profile.

Dimensions—Height 61, diameter 17, height of body whorl 37, height of aperture 27 mm.

Observations—There seem to be no diagnostic features to distinguish Tate's species *Mitra fodinalis* from the present species. *M. fodinalis* was never fully described or figured. The intersutural sulcus on which Tate separated it from

diductua is a broad constriction present in two specimens but not a constant feature.

Material—Holotype and paratype of *M. diductua*; five specimens labelled "*Mitra fodinalis*" Tate 1899, four of which are *M. diductua* and one *M. coxi*; 23 examples, either juvenile or imperfect, Abattoirs Bore.

Stratigraphical Range—Bookpurnong Beds-Dry Creek Sands.

Geographical Range—Tarcena, N.S.W.-Adelaide, S.A.

Family VASIDAE

Genus TUDICLA Röding, 1798

Tudicla Röding ex Bolten, 1798, Mus. Bolt., 2, p. 145.

(*Pyrella* Swainson, 1835, Elem. Conch., p. 21.)

(*Spirillus* Schlüter, 1838, Kurzg. syst. Verz. Conch., p. 21.)

(*Pyrenella* Gray, 1857, Guide Moll. Brit. Mus., 1, p. 11.)

Type species (s.d. Fischer, 1884) *Murex spirillus* Linné.

Subgenus TUDICLA s. str.

Tudicla (*Tudicla*) *sinotecta* Ludbrook

Tudicla sinotecta Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 97, pl. 5, fig. 14.

Diagnosis—A small *Tudicla* with a very short conical spire. Protoconch large, of two bulbous turns flat on top with tip immersed. Adult whorls three, very rapidly increasing with slightly concave sides. Body whorl concave, posteriorly acutely angulate at the periphery where there are about 12 sharp angular ridges. Ridges shown on the suture of the spire whorls as deep undulations. Sculpture of fine and irregular spiral threads crossed by frequent fine growth striae. Columella with a single twist.

Dimensions—Height 23.5, diameter 15, height of aperture and canal 20 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1639.

Observations—No further examples of this species have been found since it was originally described. It is close to the Indo-Pacific type species *T. (T.) spirillus* (Linné). The genus appears to be fairly widespread from Europe through the Indo-Pacific to Australia and to North America.

Material—Holotype, portions of three paratypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Family HARPIDAE

Genus HARPA Röding, 1798

Harpa Röding ex Bolten, 1798, Mus. Bolt., p. 149.

(*Cithara* Hermannsen ex Klein, 1846, Ind. Gen. Mal., p. 239.)

Type species (s.d. Children, 1823) *Harpa ventricosa* Lamarck = *Buccinum harpa* Linné.

Subgenus AUSTROHARPA Finlay, 1931

Austroharpa Finlay, 1931, Trans. N.Z. Inst., 62, p. 13.

(*Deniharpa* Iredale, 1931, Rec. Aust. Mus., 18 (4), p. 230.)

(*Trameharpa* Iredale, 1931, *ibid.*)

(*Palumharpa* Iredale, 1931, *ibid.*)

Type species (o.d.) *Harpa pulligera* Tate.

Harpa (*Austroharpa*) *tatei* (Finlay)

pl. 4, fig. 5

Austroharpa tatei Finlay, 1931, Trans. N.Z. Inst., 62, p. 14.

Austroharpa sulcosa Tate var. Cotton & Woods, 1933, Rec. S. Aust. Mus., 5 (1), p. 45.

Austroharpa sulcosa Tate, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small, slender *Austroharpa* with protoconch of $2\frac{1}{2}$ turns and 3 adult whorls flattened on the shoulder and bluntly rounded on the periphery. Spire whorls with low spiral bands developing to ten on the body whorl, overriden by 33 narrow, sharp, axial lamellae.

Description of Holotype—Shell small, rather thin; protoconch somewhat pitted, paucispiral, of 2½ turns, the first dome-shaped with immersed tip, the second with steep sides. Adult whorls three, flattened on the shoulder, roundly angulate on the periphery. Axial sculpture dominant, of sharp, narrow lamellae, 33 on the body whorl, extending from suture to suture, weaker on the shoulder and broadly angulate on the periphery. Axial interspaces with very fine, irregular growth striae. Spiral sculpture of gradually developing weak bands equal to the depressed interspaces. Ten spiral bands on the body whorl, each band with about four weak spiral lirae between but not crossing the axial lamellae; interspaces smooth but for axial growth lines.

Aperture narrowly oval, outer lip only slightly thickened and reflected, gently curved.

Dimensions—Height 25.5, diameter 17, height of body whorl 22, height of aperture 20, width of aperture 5 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Collection, No. 67, Auckland Museum, New Zealand.

Observations—*Harpa* (*Austroharpa*) *tatei* Finlay is very close to *Harpa sulcosa* Tate. It is less angulate on the periphery, somewhat higher, and its spiral sculpture is more valid than in *sulcosa*. In *H. sulcosa* there are 38 axial lamellae on the body whorl.

Material—The holotype, kindly lent by Dr. A. W. B. Powell, Assistant Director, Auckland Museum.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Harpa (*Austroharpa*) *cassinoides* Tate

pl. 4, fig. 4

Harpa cassinoides Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 150, pl. 6, fig. 4; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 99; Finlay, 1931, Trans. N.Z. Inst., 62, May, p. 12; Iredale, 1931, Rec. Aust. Mus., 18 (4), June, p. 230.

Austroharpa cassinoides (Tate), Cotton & Woods, 1933, Rec. S. Aust. Mus., 5 (1), p. 47.

Diagnosis—A small, stout *Austroharpa* with a low spire; protoconch dome-shaped, of two turns. Adult whorls two, each sculptured with 12 broad axial lamellae which are more or less tuberculated by three indistinct angulations on the periphery.

Dimensions—Height 29, diameter 22, height of aperture 27 mm.

Type Locality—Well-sinking, Tareena, N.S.W. ("Murray Desert").

Location of Holotype—Tate Mus. Coll., T 692.

Material—Holotype; one example from boring Hd. Munno Para, Sec. 4251, 238-256 feet (1955).

Stratigraphical Range—(?) Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—Tareena, N.S.W.-Adelaide, S.A.

Family VOLUTIDAE

Subfamily VOLUTINAE

Genus CYMBIOLA Swainson, 1831

Cymbiola Swainson, 1831, Zool. Ill. ser. 2, 2 (18), pl. 83.

(*Ausoba* H. & A. Adams, 1853, Gen. Rec. Moll., 1, p. 160.)

Type species (tautonymy) *Voluta cymbiola* Sowerby ex Chemnitz.

Subgenus CYMBIOLA s. str.

Cymbiola (*Cymbiola*) *tabulata* (Tate)

pl. 6, fig. 2

Voluta tabulata Tate, 1888, Trans. Roy. Soc. S. Aust., 10, p. 13, fig. 3; 1889, *id.*, 11, p. 132, 1899a, *id.*, 23 (1), p. 104; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), pp. 100-137.

Aulica tabulata Tate, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Notorobula tabulata Tate, Cotton, 1949a, Rec. S. Aust. Mus., 9 (2), p. 194.

Diagnosis—A *Cymbiola* with a moderate-sized protoconch of two-and-a-half smooth, gently convex whorls separated by deep impressed sutures. Spire rather short. Adult whorls angulated at the anterior one-third, each whorl bearing ten axial costae which are sharply raised into angular tubercles on the keel. Columella with four approximately equidistant folds.

Dimensions—Height 36, diameter 17, height of aperture 26, diameter of pullus 2.5 mm.

Type Locality—Well-sinking, Tareena, N.S.W. ("Murray Desert").

Location of Holotype—Tate Mus. Coll., T 611A.

Observations—The species belongs to a group of *Cymbiola* characterized by the moderate spire, by the sharply tuberculate costae on the whorls and by the protoconch, which is fairly elevated and has deeply impressed to canalliculate sutures. Axial costae are completely absent or obsolete on the protoconch. The species does not appear to be related to *Cymbiola* (*Notovoluta*) *kreuslerae* type species of *Notovoluta* Cotton, which has an elevated spire, almost smooth costae on the whorls and a smooth protoconch with relatively weak sutures. The nearest allied species is *C. (C.) pulchra* (Sowerby) of northern Australia.

Material—The figured hypotype F 15409 and six specimens Kooyonga Bore; three neanic specimens Weymouth's Bore.

Stratigraphical Range—?Bookpurnong Beds-Dry Creek Sands.

Geographical Distribution—Tareena, N.S.W.-Adelaide, S.A.

Subgenus *AULICINA* Rovereto, 1899

Aulicina Rovereto, 1899, Atti. Soc. Ligust., 10, p. 103 (*nomen novum* for *Vespertilio* Mörch, 1852).

(*Vespertilio* Mörch, 1852, Cat. Yoldi, 1, p. 123, *non* Linné, 1758.)

(*Scapha* Gray, 1847, Proc. Zool. Soc., 15, p. 141.)

Type species (s.d. Fischer, 1887) *Voluta vespertilio* Linné.

Cymbiola (*Aulicina*) *uncifera* (Tate)

Voluta uncifera Tate, 1888, Trans. Roy. Soc. S. Aust., 10, pl. 12, fig. 10; 1889, *id.*, p. 124;

Tate & Dennant, 1893, *id.*, 17 (1), p. 220; Dennant & Kitson, 1903, Rec. Geol. Surv.

Vic., 1 (2), p. 100; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis (from juvenile and incomplete specimens only)—An *Aulicina* with a very large, broad, dome-shaped protoconch of four whorls, each with about 16 axial costae, somewhat angulate on the periphery. Adult whorls with from 8 to 11 axial ribs raised into sharp, low spines on the periphery. Columella with four conspicuous folds.

Dimensions—Height 34, diameter 20, height of aperture 22, diameter of pullus 10 mm.

Type Locality—R. Murray Cliffs, near Morgan; Miocene.

Location of Holotype—Tate Mus. Coll., T 394B.

Material—Holotype and paratype; fragments, Abattoirs Bore.

Stratigraphical Range—Miocene-Dry Creek Sands.

Geographical Distribution—River Murray-Adelaide.

Genus *AMORIA* Gray, 1855

Amoria Gray, 1855, Proc. Zool. Soc., 23, p. 64.

Type species (s.d. Harris, 1897) *Voluta turneri* Gray.

Subgenus *AMORIA* s. str.

(*Relegamoria* Iredale, 1936, Rec. Aust. Mus., 19 (5), p. 314.)

Amoria (*Amoria*) *grayi* Ludbrook

pl. 6, fig. 1

Voluta pallida Gray, 1834, in Griffith's Cuvier, pl. 30, fig. 4, p. 601 (*non Voluta pallida* Linné, 1767); Kiener, 1839, Coq. viv. Genres Volute, p. 51, pl. 48, fig. 1; Sowerby, 1844, Thes. Conch., part 5, p. 196 (*pars*), pl. 53, fig. 91; Chenu, 1859, Man. de Conch., 1, p. 187, fig. 951; M. Smith, 1940, World Wide Sea Shells, sp. 873, p. 65 (*fide* Smith, 1942).

Voluta volva Chemnitz, Reeve, 1849, *Conch. Icon.*, 6, *Voluta* sp. 24, pl. 11, fig. 24; Crosse, 1871, *Journ. de Conch.*, 19, ser. 3, 11 (4), p. 290; Kobelt, 1877, *Jahrb. Malak. Gesellsch.*, p. 307; Petterd, 1879, *Journ. Conch.*, p. 342.
Amoria turneri Cray, 1855, *Proc. Zool. Soc.*, p. 64 (*pars.*).
Amoria turneri pallida Gray, 1864, *Ann. Mag. Nat. Hist.*, ser. 3, 14, p. 237.
Voluta (*Amoria*) *volva* Chemnitz, Angas, 1864, *Proc. Zool. Soc.*, p. 53.
Voluta (*Amoria*) *volva* Gmelin, Tryon, 1882, *Mar. Conch.*, 4, p. 93, pl. 28, fig. 99.
Scaphella volva, Gmelin, Hedley, 1909, *Aust. Assoc. Adv. Sci.*, p. 362; Iredale, 1911, *Proc. Zool. Soc.*, p. 667.

Amoria pallida pallida (Gray), M. Smith, 1942, *Rev. Volutidae*, p. 52, pl. 4, fig. 33, pl. 5, fig. 45; Cotton, 1949, *Rec. S. Aust. Mus.*, 9 (2), p. 193.

Amoria (*Amoria*) *grayi* Ludbrook, 1954, *Proc. Mal. Soc.*, 30, p. 136, pl. 14, figs. 4, 5.

Diagnosis—A large *Amoria* with a rather attenuated spire and polygyrate papillate protoconch with a sharp tip. Whorls generally constricted above suture; suture enamelled over. Body whorl large, rather narrow, gradually tapering anteriorly. Aperture narrow posteriorly, widening gradually anteriorly. In the unbleached living shell colour creamy white, generally tinted above the suture of the adult whorls with brown; body whorl encircled with obscure light brown colour bands.

Dimensions—Height 92, diameter 31, height of aperture 62, greatest width of aperture (at anterior one-third) 14 mm.

Type Locality—Mouth of River Swan, Western Australia; Recent.

Location of Holotype—B.M. Coll., 1952, 3.21.1.

Observations—The synonymy and identity of this species has been published elsewhere (Ludbrook, 1954, p. 136). It is most unexpected to discover the species in the Pliocene of South Australia, but the identity seems undoubted.

Material—The figured hypotype F 15410, Kooyonga Bore; Recent material listed Ludbrook, 1954, pp. 136-7.

Stratigraphical Range—Dry Creek Sands—Recent.

Geographical Distribution—Pliocene—Adelaide; Recent—Perth to Cambridge Gulf, Western Australia.

Subfamily SCAPHELLINAE

Genus *ERICUSA* H. & A. Adams, 1858

Ericusa H. & A. Adams, 1858, *Gen. Rec. Moll.*, 2, p. 619.

Type species (s.d. Cotton & Godfrey, 1932) *Voluta fulgetrum* Sowerby.

Subgenus *ERICUSA* s. str.

Ericusa (*Ericusa*) *ellipsoidea* (Tate)

Voluta ellipsoidea Tate, 1888, *Trans. Roy. Soc. S. Aust.*, 10, pl. 13, fig. 4; 1889, *id.*, 11, p. 127; Dennant & Kitson, 1903, *Rec. Geol. Surv. Vic.*, 1 (2), p. 100; Ludbrook, 1941, *Trans. Roy. Soc. S. Aust.*, 65 (1), p. 100.

Voluta (*Aulica*) *ellipsoidea* Tate, Harris, 1897, *Cat. Tert. Moll. Brit. Mus.*, 1, p. 105.

Diagnosis—An *Ericusa* of moderate size, narrow with an elongate spire. Protoconch high, of three-and-a-half smooth whorls separated by a deeply impressed suture. Nucleus central, somewhat sunken. Adult whorls four, of which the first neanic whorl is narrower than the last embryonic whorl. Body whorl elongate and only slightly inflated. Columella with four stout, oblique folds. Spire and body whorls sculptured with numerous fine spiral lirae crossed by frequent crowded axial growth striae.

Dimensions (Hypotype)—Height 62, diameter 23, height of aperture 42, width of aperture 7, height of protoconch 6, diameter of protoconch 6 mm.

Type Locality—Lower beds, Muddy Creek, Vic.; Miocene.

Location of Holotype—Tate Mus. Coll., T 601C.

Material—Four portions of spires, Abattoirs Bore; specimen G 4255, juvenile, B.M. Coll.

Stratigraphical Range—Miocene—Dry Creek Sands.

Geographical Distribution—Port Phillip Bay, Vic.—Adelaide, S. Aust.

***Ericusa (Ericusa) ancilloides* (Tate)**

pl. 4, figs. 1, 2

Voluta ancilloides Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 126, pl. 3, fig. 7; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 100.

Fulgurina ancilloides (Tate), Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Ericusa ancilloides Tate, Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 186, pl. 14, fig. *ancilloides*.

Diagnosis—A large solid *Ericusa* with a very large globose protoconch of one-and-a-half whorls with laterally immersed tip. Adult whorls 3 in a total height of 75 mm. Adult shell microscopically sculptured with fine axial growth striae, about 6 per mm, crossed particularly in the first whorl by fine spiral lirae about 6 per mm. Columella very arcuate with three oblique folds set well within the aperture. Outer lip thickened, almost vertical in profile.

Dimensions—Height 75, diameter 28, height of aperture 47, height of protoconch 6, diameter of protoconch 8 mm.

Type Locality—Schnapper Point, Victoria; Miocene.

Location of Holotype—Tate Mus. Coll., T 396D.

Material—Holotype and three paratypes; 12 broken specimens, Abattoirs Bore; one specimen complete but for protoconch, Bore, Hd. of Munro Para, Sec. 4251, 238-256 ft.; several protoconchs, Hindmarsh Bore.

Stratigraphical Range—(?) Oligocene-Dry Creek Sands.

Geographical Distribution—Schnapper Point, Victoria, to Adelaide, South Australia.

Family CANCELLARIIDAE

Genus APHERA H. & A. Adams, 1854

Aphera H. & A. Adams, 1854, Gen. Rec. Moll., p. 277.

Type species (monotypy) *Cancellaria tessellata* Sowerby.

Subgenus SYDAPHERA Iredale, 1929

Sydaphera Iredale, 1929, Aust. Zool., 5 (4), p. 341.

Type species (o.d.) *Sydaphera renovata* Iredale.

***Aphera (Sydaphera) wannonensis* (Tate)**

pl. 6, fig. 6

Cancellaria wannonensis Tate, Dennant, 1889, Trans. Roy. Soc. S. Aust., 11, p. 44 (*nom. nud.*); Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 156, pl. 8, fig. 11; 1890a, *id.*, 13 (2), p. 176; Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 66; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), pp. 98, 137, 142; Cressin, 1943, Min. Res. Surv. Bull., 9, p. 96.

Diagnosis—A fusiformly ovate *Sydaphera*, with acuminate spire, protoconch subcylindrical, of two-and-a-half turns. Adult whorls roundly shouldered just below the suture, sculptured with about 12 narrow, obliquely arched more or less elevated axial ribs per whorl and close axial growth lamellae on both ribs and interspaces. Spiral sculpture of conspicuous flat spiral lirae, generally primary and secondary. Columella with three, and in senile examples four, folds. Outer lip crenulated by the spiral lirae on the margin.

Dimensions—Length 29, breadth 17, length of aperture 20, width 9 mm.

Type Locality—Upper beds, Muddy Creek, Victoria; Pliocene.

Location of Holotype—Tate Mus. Coll., T 725C.

Observations—The specimens from Thebarton Bore, though typical in other respects, are lirate within the outer lip.

Material—The figured hypotype F 15411 and three other specimens, Thebarton Bore. One specimen Tennant's Bore. Topotypes G 4259, G 5524, G 9374, B.M. Coll.

Stratigraphical Range—Kalinman-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, South Australia.

Genus CANCELLAPHERA Iredale, 1930

Cancellaphera Iredale, 1930, Mem. Qld. Mus., 10 (1), p. 80.

Type species (monotypy) *Cancellaphera amasia* Iredale.

Cancellaphera confirmans sp. nov.

pl. 6, fig. 5

Oamaruta tatei COSSMANN, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small *Cancellaphera* with a high, conspicuous protoconch of 2 flatly convex whorls separated by deep sutures. Adult whorls deeply channelled at the shoulder, sculptured with 13 axial ribs per whorl crossed and tuberculated by spiral ribs of which there are 5 on the first adult and 11 on the body whorl. Columella with three folds of which the median two are stronger than the anterior fold.

Description of Holotype—Shell small, subovate, whorls tabulate at the shoulder, protoconch high and conspicuous, two smooth, flatly convex whorls separated by deep sutures. Adult whorls two, deeply channelled at the shoulder, sculptured with 15 axial ribs on each whorl crossed and strongly tuberculated by spiral ribs, of which there are five on the first adult whorl and eleven on the body whorl; interspaces deep, subrhombic.

Aperture about half height of shell, subtriangular, columella nearly straight, with three folds of which the two medial are stronger than the third at the anterior extremity. Outer lip broken in the holotype. Umbilicus small, margined with a thickened cord supporting three spiral ribs and partly closed by the reflected inner lip.

Dimensions—Height 8, diameter 5, height of body whorl 6 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15412.

Observations—It is interesting to find a second species of this hitherto monotypic genus from Queensland among the Adelaide material. The present species strikingly resembles the type species. The protoconch appears to be relatively larger and higher and the sculpture is coarser. The holotype is somewhat immature; one incomplete specimen from Abattoirs Bore has $2\frac{1}{2}$ adult whorls and is 10 mm. high.

Material—Holotype, Weymouth's Bore; one incomplete paratype and nine fragments, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Family MARGINELLIDAE

Genus MARGINELLA Lamarck, 1799

Marginella Lamarck, 1799, Mem. Soc. Hist. Nat., Paris, p. 70.

(*Marginellarius* Duméril, 1806, Zool. Analyst., p. 333.)

(*Marginellus* Montfort, 1810, Couch. Syst., 2, p. 558.)

(*Porcellana* Sowerby, 1839, Conch. Man., p. 87, non Mueller, 1776.)

(*Pseudomarginella* Maltzan, 1880, Nachrbl. dtsh. Malak. Ges., 12, p. 108.)

Type species (monotypy) *Voluta glabella* Linné.

Subgenus ERATOIDEA Weinkauff, 1879

Eratoidea Weinkauff, 1879, in Martini & Chemnitz, Syst. Conch. Cat., 5 (4), 286, p. 140.

(*Denticuloglabella* Sacco, 1890, Mem. Accad. Sci. Torino, ser. 2, 40, p. 317.)

Type species (s.d. Cossmann, 1899) *Marginella margarita* Kiener.

Marginella (Eratoidea) glaessneri sp. nov.

pl. 3, fig. 11

Marginella muscarioides Tate, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A very small *Eratoidea* with a moderately high spire and a fairly large, stout and solid body whorl. Outer lip heavily thickened and strongly incurved, from about the posterior one-third, then gradually sloping to the anterior margin. Anterior margin of aperture straight and not excavate dorsally.

Description of Holotype—Shell very small, pyriform, smooth, solid, shining. Spire of moderate height, apex flattish and covered with enamel. Adult whorls three, gradually increasing, body whorl large, swollen in the middle and constricted anteriorly. Sutures inconspicuous, linear, covered with enamel. Aper-

ture of moderate length, attached well below the summit of the body whorl, oblique outer lip heavily thickened and strongly incurved from about the posterior one-third then gradually sloping to the anterior margin. Columella nearly straight with four stout, equally-spaced, slightly oblique, short, stout folds. Anterior margin of aperture straight.

Dimensions—Height 3, diameter 2, height of aperture 2.4 mm.

Type Locality—Hindmarsh Bore, 450-487 feet.

Location of Holotype—Tate Mus. Coll., F 15413.

Observations—This is a very small species, very like *M. muscarioides* Tate, with which it was formerly identified. It is apparently always less than half the size of *M. muscarioides*; its spire is less elevated and less constricted at the sutures. The species is named in honour of Dr. M. F. Glaessner, Reader in Palaeontology, University of Adelaide.

Material—Holotype, Hindmarsh Bore; nineteen paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Hindmarsh and Weymouth's Bores.

Marginella (Eratoidea) wentworthi Tenison Woods

pl. 3, fig. 10

Marginella wentworthi Tenison Woods, 1877, Pap. Roy. Soc. Tas. for 1876, p. 100; R. Etheridge, jun., 1878, Cat. Aust. Foss., p. 163; Tate, 1878, Trans. Phil. Soc. Adel., 1877-8, p. 92; Johnston, 1888, Geol. Tas., pl. 31, figs. 5, 5a; Dennant, 1889, Trans. Roy. Soc. S. Aust., 11, p. 43; Tate & Dennant, 1893, *id.*, 17 (1), p. 220; Tate & Dennant, 1895, *id.*, 19 (1), p. 111; Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 82; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 99; Chapman, Crespin & Keble, 1928, Rec. Geol. Surv. Vic., 5, p. 165; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100; Crespin, 1943, Min. Res. Surv. Bull., 9, p. 97; Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 217, pl. 17, fig. *wentworthi*.

Marginella kalimnae Chapman & Crespin, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A small, somewhat elongate *Eratoidea*, with protoconch of one barely distinguishable, flattish, smooth turn. Spire moderately high, body whorl slender with tendency to angulation at the periphery, aperture relatively short and somewhat expanded in the middle; outer lip thickened and denticulate, the posterior denticle being generally, but not always, larger and more prominent than the remainder; anterior canal wide, anterior margin convex. Columella with four stout folds.

Dimensions—Height 6, diameter 3.3 mm.

Type Locality—Table Cape, Tasmania; ? Oligocene.

Location of Holotype—(?) Hobart Museum, Tasmania.

Observations—*M. (E.) wentworthi* appears to be a very long-ranging and widely-dispersed species in the Tertiaries of southern Australia. The species needs closer study from a greater selection of material. Adelaide specimens are small, but otherwise similar to examples from Muddy Creek (lower beds). Specimens previously recorded from Abattoirs Bore (Ludbrook, 1941, p. 100) as *M. kalimnae* are not juveniles of that species as previously considered.

Material—The figured hypotype F 15414 and four other specimens, Hindmarsh Bore; nine examples, Abattoirs Bore; 3 examples Weymouth's Bore; 14 examples (G 4213, G 9341), Muddy Creek, Victoria, B.M. Coll.; two topotypes, Table Cape, Tasmania.

Stratigraphical Range—? Oligocene-Dry Creek Sands.

Geographical Distribution—Cippsland, Vic.-Adelaide, S. Aust.; Tasmania.

Marginella (Eratoidea) meta Cotton

Marginella meta Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 213, pl. 18, fig. *meta*.

Diagnosis—A small, rather narrow *Eratoidea* with a blunt protoconch and a long spire.

Dimensions—Height 4, diameter 2 mm.

Type Locality—Bore 21, Adelaide Plains, at 400 feet.

Location of Holotype—S. Aust. Mus., No. P 8795.

Observations—It is extremely doubtful whether this monotypic species, founded on an immature specimen, should be separated from *M. wentworthi*. Sufficient material is not available for precise definition of either species, or of *M. crista*, below.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 21, Adelaide.

Marginella (Eratoidea) crista Cotton

Marginella crista Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 216, pl. 18, fig. *crista*.

Diagnosis—A small, elongate *Eratoidea* with a high spire and a blunt protoconch. Aperture short, a little more than half height of shell.

Dimensions—Height 4.8, diameter 2 mm.

Type Locality—Weymouth's Bore, 450 feet.

Location of Holotype—S. Aust. Mus., No. 8791.

Observations—A monotypic species, probably identical with *M. meta*.

Material—Holotype only.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Genus GIBBERULA Swainson, 1840

Gibberula Swainson, 1840, Trent. Malac., p. 323.

Type species (monotypy) *Gibberula zonata* Swainson = *Volvaria oryza* Lamarck.

Gibberula clima (Cotton)

pl. 3, fig. 13

Marginella clima Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 213, pl. 18, fig. *clima*.

Diagnosis—A small, globose *Gibberula* with a small spire, flatly rounded at the apex. Body whorl large, constricted anteriorly. Aperture of moderate width. Outer lip thickened, wider medially.

Dimensions—Height 5.2, diameter 3.7 mm.

Type Locality—S.A. Mines Department Bore 21, at 400 feet.

Location of Holotype—S. Aust. Mus., No. P 8797.

Material—Holotype and paratype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 21, Adelaide.

Gibberula talla (Cotton)

pl. 3, fig. 14

Marginella talla Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 213, pl. 18, fig. *talla*.

Marginella cassida Cotton, *ibid.*, p. 216, pl. 18, fig. *cassida*.

Diagnosis—A narrow *Gibberula* with a short and rather small spire. Body whorl long, rounded at shoulder and gradually tapering anteriorly. Outer lip narrowly thickened, slightly sinuous, without denticulations and attached at the suture of the body whorl.

Dimensions—Height 5, diameter 3 mm.

Type Locality—S. Aust. Mines Department Bore 21, at 400 feet.

Location of Holotype—S. Aust. Mus., No. P 8796.

Observations—There is apparently a typographical error in the height of the shell as given in the original description. The holotype of *cassida* is almost identical with that of *talla*.

Material—Holotypes only of *talla* and *cassida*.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 21, Adelaide Plains.

Genus CLOSLIA Gray, 1857

Closia Gray, 1857, Guide Syst. Moll. Brit. Mus., p. 36.

Type species (monotypy) *Marginella sarda* Kiener.

Subgenus CLOSLIA s. str.

Closia (*Closia*) *moana* (Ludbrook)

Marginella moana Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 97, pl. 5, fig. 15;
Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 220, pl. 17, fig. *moana*.

Diagnosis—A small, solid pyriform *Closia* with a long, narrow aperture raised above the immersed apex. Outer lip finely and weakly denticulate within, columella generally with four folds of which the anterior two are generally stronger, and sometimes with a fifth weak fold situated well within the shell; columella concave anteriorly.

Dimensions—Height of whorl 4.1, height of aperture 4.3, diameter 3.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., Univ. of Adelaide, T 1642.

Observations—Cotton (1949, p. 220) has drawn attention to the fifth fold to which reference was not made in the original description—the writer pleads guilty to oversight in this matter—and which is not shown in the original figure. This fold is present in some specimens only, including the holotype, and can be viewed only by rotating the shell so that the columellar interior is well exposed. The appearance of the columellar fold in normal view is as given in the original figure and not as in the figure accompanying Cotton's note (Cotton, l.c. pl. 17, fig. *moana*), where five folds of approximately equal strength are shown.

Material—Holotype and four paratypes, Abattoirs Bore; eleven specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores.

Closia (*Closia*) *arena* (Cotton)

pl. 3, fig. 16
Marginella arena Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 214, pl. 18, fig. *arena*.

Diagnosis—An ovate *Closia* with a slightly depressed spire. Columella and outer lip regularly convex, aperture crescent-shaped. Columella with six folds, outer lip narrowly thickened, without denticles.

Dimensions—Height 3, diameter 2 mm.

Type Locality—S. Aust. Mines Department Bore 21, Adelaide Plains.

Location of Holotype—S. Aust. Mus., No. P 8794.

Material—Holotype only.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 21, Adelaide District.

Closia (*Closia*) *planilabrum* sp. nov.

pl. 3, fig. 12
Marginella globiformis Chapman & Crespin, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Diagnosis—A very small, globose, pyriform *Closia* with a flat or only slightly convex spire. Aperture reaching to the apex but not extending beyond it, attached almost horizontally at the suture. Thickening of the outer lip, flat within and convex on the outer edge; lip without denticulations. Columella with seven folds, the interior two of which are stronger.

Description of Holotype—Shell very small, globose-pyriform, smooth, solid, spire flatly convex but not immersed, body whorl globose, constricted anteriorly. Aperture long, gently arcuate, reaching almost to the apex but in the holotype not extending beyond it, attached almost horizontally at the suture of the body whorl. Outer lip moderately thickened, flattened within, convex on the outer

edge, without denticulations. Columella with seven folds, the anterior two of which are longer and more prominent than the remainder. Behind the lowest fold which borders the anterior canal there is a narrow depression.

Dimensions—Height 2.1, diameter 2.0 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15415.

This species differs in shape and in the number of columellar folds from the Miocene *globiformis* with which it was originally identified. The aperture is shorter relative to the shell than it is in *globiformis*. It is more sharply constricted anteriorly than *arena*.

Material—The holotype and six paratypes, Weymouth's Bore; one paratype, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Closia (Closia) doma (Cotton)

pl. 3, fig. 18

Marginella doma Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 213, pl. 18, fig. *doma*.

Diagnosis—A fairly large, elongate *Closia* with spire not extended beyond body whorl. Columella with five folds; outer lip finely denticulate.

Type Locality—S.A. Govt. Bore 28, 360 feet.

Location of Holotype—S. Aust. Mus., No. P 8793.

Material—The holotype, the figured hypotype F 15416, and two other specimens, Weymouth's Bore, 310-330 feet; 2 worn specimens, doubtfully belonging to the species, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 28 and Weymouth's Bore, Adelaide.

Genus SERRATA JOUSSAUME, 1875

Serrata Jousseaume, 1875, Rev. Mag. Zool., ser. 3, 3, pp. 167, 230.

Type species (tantonmy) *Marginella serrata* Gaskoin.

Serrata charma (Cotton)

pl. 3, fig. 19

Marginella charma Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 214, pl. 18, fig. *charma*.

Diagnosis—A small, thick and solid *Serrata*, somewhat cassid shaped. Spire short, body whorl large, constricted anteriorly. Columella with four folds, the anterior of which is stronger than the remaining three. Outer lip denticulate.

Dimensions—Height 4, diameter 3 mm.

Type Locality—S.A. Govt. Bore 28, 360 feet.

Location of Holotype—S. Aust. Mus., No. P 8783.

Observations—The figure accompanying the original description of this species is at some variance with the description, and the relative measurements are not in conformity with those given for the holotype. The species is less elongate than would appear from the original figure.

Material—The holotype and paratype; the figured hypotype F 15417 and 3 other specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 28 and Weymouth's Bore, Adelaide Plains.

Serrata metula (Cotton)

pl. 3, fig. 17

Marginella metula Cotton, 1949, Rec. S. Aust. Mus., 9 (2), p. 214, pl. 18, fig. *metula*.

Diagnosis—A rather narrow, fairly large, elongate-ovate *Serrata* with a depressed spire. Aperture narrow, gently arcuate; outer lip thin, with numerous elongate and weak denticles within; columella with two strong folds at the anterior and as many as ten weaker folds, the number, disposition and strength

varying with individuals, posterior to these. Base calloused to about the position of the third denticle from the anterior.

Dimensions—Height 5.2, diameter 3.2 mm.

Type Locality—S. Aust. Govt. Bore 21, Adelaide Plains, 400 feet.

Location of Holotype—S. Aust. Mus., No. P 8782.

Material—Holotype, paratype, figured hypotype, F 15418, and two other specimens, Weymouth's Bore, 310-330 feet.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Bore 21 and Weymouth's Bore, Adelaide.

Serrata bicrassiplicata sp. nov.

pl. 3, fig. 21

Diagnosis—A small, rather narrow *Serrata* with a small conical spire, rounded at the apex. Aperture long, gently increasing in width anteriorly; columella with two very stout and prominent folds anteriorly, the lower of which is subtriangular, the upper elongate and prominent, and above these two narrow, slender and widely-spaced folds. Outer lip smooth but not ridged without, denticulate well within.

Description of Holotype—Shell small, moderately narrow, elongate-ovate, with a small and short conical spire, rounded at the apex. Body whorl large, gradually narrowing anteriorly, aperture long, reaching nearly to the suture of the body whorl, increasing somewhat in width anteriorly. Columella very gently convex, with four folds; the anterior fold is large, prominent and subtriangular in shape, the second fold is large, long and prominent; above these are two narrow, slender and weaker folds, widely spaced. Outer lip scarcely thickened, smooth and not ridged without, finely denticulate well within the margin. Anterior canal excavate dorsally.

Dimensions—Height 3.9, diameter 2.25 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15419.

Observations—The nearest related species appears to be *S. patria* (Cotton) Recent from Western Australia. The fossil species differs in the nature of the columellar folds and in the shape of the aperture, including the manner of attachment of the posterior extremity.

Material—The holotype and 21 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Serrata weymouthensis sp. nov.

pl. 3, fig. 20

Diagnosis—A subovate *Serrata* with a short conical spire. Body whorl fairly large and rather broad, somewhat constricted anteriorly. Aperture attached to body whorl at the shoulder below the suture. Columella with six folds increasing in length towards the anterior. Outer lip almost straight, only very narrowly ridged without, denticulate within, anterior canal excavate dorsally.

Description of Holotype—Shell small, subovate, of moderate width with a short conical spire rounded at the apex. Body whorl fairly large, moderately constricted anteriorly; aperture of moderate length, attached to body whorl at the shoulder and well below the suture, widening slightly towards the anterior. Columella gently convex, with six folds increasing in length from posterior to anterior. Outer lip almost straight and gently incurved posteriorly; thickened without but ridged only very narrowly over the anterior portion of its length; denticulate within. Anterior canal excavate dorsally.

Dimensions—Height 3.9, diameter 2.7 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15420.

Material—Holotype and twelve paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Genus VOLVARINA Hinds, 1844

Volvarina Hinds, 1844, Proc. Zool. Soc., 12, p. 75.

(*Porcellanella* Conrad, 1862, Proc. Acad. Nat. Sci. Philad., p. 564.)

Type species (o.d.) *Marginella avena* Valenciennes

Volvarina (^p) *incommoda* sp. nov.

pl. 3, fig. 15

Marginella sp. Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 97.

Diagnosis—A small marginellid possibly belonging to *Volvarina* with a high, blunt spire and whorls separated by deep sutures. Body whorl of moderate size, gently convex. Aperture a little more than two-thirds height of shell, increasing in width anteriorly and separated from the whorl by a marked channel posteriorly. Outer lip slightly sinuous and incurved in the posterior medial portion. Columella with four folds at the anterior. Base with a spread of callus up to the position of the fourth fold.

Description of Holotype—Shell small, stout, elongate-ovate and rather pupiform. Body whorl of moderate size, elongate and gently convex. Apex roundly depressed, spire blunt. Adult whorls separated by deep and conspicuous sutures. Aperture a little more than two-thirds height of shell, increasing in width anteriorly and separated from the whorl posteriorly by a definite channel. Outer lip not thickened, slightly sinuous, incurved above the middle, finely denticulate within. Columella with four folds. Outer lip callus spreading forward over the base to the position of the fourth fold.

Diagnosis—Height 6.3, diameter 3.3, height of aperture 4.65 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., F 15421.

Observations—This species was not named or figured in the original reference, although it was almost completely described. No further material has been obtained, but as the well-preserved specimen seems to be of a unique type in the Australian Tertiary it is here named and figured. Its affinities are obscure. Generically it seems closest to an Indo-Pacific group represented by "*Marginella*" *sarcodes* Tomlin and "*Marginella*" *serri* Bavay, which may belong to *Volvarina*.

Material—Holotype only.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Superfamily CONACEA

Family TURRIDAE

Subfamily TURRINAE

Genus XENUROTURRIS Iredale, 1929

Xenuroturrus Iredale, 1929, Mem. Qld. Mus., 9 (3), p. 285.

Type species (o.d.) *Xenuroturrus legitima* Iredale.

Subgenus VERUTURRIS Powell, 1944

Veruturrus Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 9.

Type species (o.d.) *Xenuroturrus* (*Veruturrus*) *quadracarinalus* Powell.

Xenuroturrus (*Veruturrus*) *tomopleuroides* Powell

pl. 5, fig. 2

Xenuroturrus (*Veruturrus*) *tomopleuroides* Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 11,
pl. 1, fig. 3.

Veruturrus tomopleuroides Powell, Cotton, 1947, Conch. Club S. Aust., 4, p. 3.

Diagnosis—A small *Veruturris* with a broadly rounded protoconch of 2 smooth whorls, followed by three-quarters of a whorl with brephic axials. Adult whorls sculptured with two spiral threads below the suture, a moderate cord at the posterior one-fourth and a strong cord or carina on the periphery followed by a spiral bordering the lower suture. On the body whorl a fourth strong spiral cord emerges near or just beneath the top of the aperture. About 18 weaker cords on the base and anterior canal. Interspaces marked by growth lines indicating the outline of the sinus which is broadly V-shaped with apex on the uppermost of the strong cords.

Dimensions—Height 17.5, diameter 5.5 mm.

Type Locality—Abattoirs Bore, 400-500 feet, Adelaide.

Location of Holotype—Finlay Collection, Auckland Mus., N.Z.

Material—Figured hypotype F 15422, Weymouth's Bore, 310-330 feet.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bore, Adelaide.

Xenuturris (*Veruturris*) *bisculptus* Powell

pl. 5, fig. 1

cf. *Filodrilla* sp. Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Xenuturris (*Veruturris*) *bisculptus* Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 11, pl. 1, fig. 4.

Veruturris bisculptus Powell, Cotton, 1947, Conch. Club S. Aust., 4, p. 3.

Diagnosis—A small *Veruturris* with a protoconch of two broadly rounded, smooth whorls followed by a whorl of brephic axials. Adult whorls flatly increasing, sculptured on the upper half of each whorl with 17 fold-like axials, crossed generally by three spiral cords nodulose at the intersections with the axials, and on the lower half of each whorl with two to three conspicuous and heavy, closely-spaced spirals. Base and anterior canal with 18 spirals. Length of anterior canal less than half total height of aperture.

Dimensions—Height 13.9, diameter 4.5 mm.

Type Locality—Abattoirs Bore, Adelaide, 400-500 feet.

Location of Holotype—Finlay Collection, Auckland Mus., N.Z.

Material—The figured hypotype F 15423, Weymouth's Bore; one topotype, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Genus *EPIDIRONA* Iredale, 1931

Epidirona Iredale, 1931, Rec. Aust. Mus., 18, p. 225.

(*Epidirona* Cotton, 1947, Conch. Club S. Aust., 4, p. 14, *lapsus calami* for *Epidirona*)

Type species (o.d.) *Epidirona hedleyi* Iredale.

Epidirona adelaidensis (Ludbrook)

Bathytoma adelaidensis Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 97, pl. 5, fig. 17.

Epidirona adelaidensis (Ludbrook), Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 16.

Epidirona adelaidensis Ludbrook, Cotton, 1947, Conch. Club S. Aust., 4, p. 5 (*lapsus calami* for *Epidirona*).

Diagnosis—An *Epidirona* of moderate size, with a moderate-sized protoconch of two smooth, bluntly rounded whorls. Adult whorls gradually increasing, sculptured with 2 close spiral cords on the shoulder; posterior to these about five fine spiral lirae crossed and somewhat tuberculated by axial growth lirae following the outline of the V-shaped sinus, the apex of which is on the shoulder; below the shoulder one or two fine, spiral ribs, which extend over the base of the body whorl where they are ten in number. Whorls carinate at the shoulder; concave above and below the carination.

Dimensions—Height 20 mm., diameter 8.5 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1622.

Material—Numerous paratypes, Abattoirs Bore; one specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Epidirona powelli sp. nov.

pl. 5, fig. 3

Epidirona suppressa (Finlay), Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 16.

Epidirona suppressa Finlay, Cotton, 1947, Conch. Club S. Aust., 4, p. 5 (*lapsus calami* for *Epidirona*).

Diagnosis—An *Epidirona* of moderate size, solid. Protoconch of two broad, smooth, subglobose turns. Adult whorls sculptured in the early whorls with from five to eight fine spiral lirae which become obsolete or die out on the fifth and sixth whorls. All whorls showing frequent crowded axial growth striae with a conspicuous sinus at about the middle of the whorl.

Description of Holotype—Shell of moderate size, broadly fusiform, solid. Protoconch of two broad, smooth subglobose turns; adult whorls six, gently convex, gradually increasing, sculptured at first with from five to eight fine, spiral lirae on the early whorls, becoming obsolete or dying out on the fifth and sixth whorls, which are relatively devoid of spiral sculpture and are polished. All whorls with frequent crowded growth striae which are conspicuously sinused at about the middle of the whorl. Suture impressed. Aperture and canal about half height of shell; outer lip broken in holotype; inner lip calloused; anterior canal twisted and notched.

Dimensions—Height 30, diameter 12, height of aperture and canal 14.5 mm.

Type Locality—Weymouth's Bore, 310-530 feet.

Location of Holotype—Tate Mus. Coll., F 15424.

Observations—Comparison of the three specimens available from Weymouth's Bore with authentic examples of *Epidirona suppressa* (Finlay) from Muddy Creek shows that although there is a strong superficial resemblance between the two, the protoconch of *E. powelli* is larger and differs somewhat in shape from that of *E. suppressa*, where the protoconch is high and the early whorls are more attenuated than the later ones. There is more gradual increase in the shell from the embryonic to the ephebic in *E. powelli* than there is in *E. suppressa*. The sculpture appears to be somewhat variable in *E. powelli*; it is stronger in the neanic stages and becomes relatively obsolete in the ephebic stage. The species is named in honour of Dr. A. W. B. Powell of Auckland Museum, who revised the Australian Tertiary Turridae.

Material—Holotype and two paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Genus *Liratomina* Powell, 1942

Liratomina Powell, 1942, Bull. Auck. Inst. Mus., 2, p. 72.

Type species (o.d.) *Bela sculptilis* Tate.

Liratomina adalaidensis Powell

Liratomina adalaidensis Powell, 1944, Rec. Aust. Inst. Mus., 3 (1), p. 27, pl. 7, fig. 5.

Liratomina adalaidensis Powell, Cotton, 1947, Conch. Club S. Aust., 4, p. 7.

Diagnosis—A moderately large *Liratomina*, with a large, smooth and rounded protoconch of 1½ whorls. Whorls prominently shouldered, with broad and deeply excavated shoulder; whorls polished, with distinct and slightly raised spiral sculpture consisting of seven to nine spiral threads in the posterior sinus area and seven to eight broad, flattened spiral cords with weakly incised linear grooves between, extending from shoulder to anterior suture. Spirals stronger and more widely spaced on lower part of base.

Dimensions—Height 32.6, diameter 16 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auck. Mus., N.Z.

Observations—This species is not known to occur except in Abattoirs Bore material in the Finlay Collection.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Subfamily CLAVINAE

Genus *INQUISITOR* Hedley, 1918

Inquisitor Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, supp. p. M, 79.

Type species (o.d.) *Pleurotoma sterrha* Watson.

Inquisitor detritus Ludbrook

Inquisitor detritus Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 98, pl. 5, fig. 18; Cressin, 1943, Min. Res. Surv. Bull., 9, p. 97; Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 27; Cotton, 1947, Conch. Club S. Aust., 4, p. 10.

Diagnosis—A small, narrow *Inquisitor* with a protoconch of two flattened, convex, smooth turns. Adult whorls slightly angled just above the middle and sculptured with about eleven prominent, narrow costae per whorl, extending from just above the angle of the whorl to the anterior suture; one conspicuous spiral rib per whorl just below the suture followed by numerous crowded lirae to the angle of the whorl, then by about five strong striae crossing axial ribs and interspaces.

Dimensions—Height 12, diameter 3.8 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1670.

Observations—No further examples of this species have been recovered from borings in the Adelaide District, but the species has now been recorded from the Kalimnan of Gippsland (Cressin, 1943, p. 97).

Material—8 paratypes and portions of 5 others, Abattoirs Bore, all somewhat eroded.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Inquisitor sp.

Observations—A small *Inquisitor* somewhat eroded and not belonging to *I. detritus* occurs in Hindmarsh Bore material. Diagnosis of the species is deferred until more material in a better state of preservation is available.

Genus *SPLENDRILLIA* Hedley, 1922

Splendrillia Hedley, 1922, Rec. Aust. Mus., 13, p. 250.

Splendrillia Thiele, 1935, Handb. Syst. Weicht., 1, p. 357 (err. pro. *Splendrillia* Hedley).

Type species (o.d.) *Drillia woodsi* Beddome.

Splendrillia trucidata (Ludbrook)

Austrodrillia trucidata Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 98, pl. 5, fig. 20;

Cressin, 1943, Min. Res. Surv. Bull., 9, p. 95.

Splendrillia trucidata (Ludbrook). Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 31.

Diagnosis—A *Splendrillia*, large for the genus, with a protoconch of moderate size, consisting of two smooth, flatly globose turns. Adult whorls sculptured with twelve axial costae per whorl abruptly terminated at the shoulder, which is high on the whorl and excavate. Spiral sculpture absent except for fine and rather flat ribs on the base. Aperture a little over one-third total height of shell; outer lip with a strong, almost rectangular notch; inner lip calloused, parietal callus thick and elevated into a tooth-like prominence.

Dimensions—Height 15, diameter 5, height of aperture and canal 6 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1625.

Observations—Since it was described from Abattoirs Bore material the species has been recovered also from the Kalimnan of Gippsland, Victoria (Crespin, 1943, p. 95).

Material—20 paratypes and portions of 4 others, Abattoirs Bore; one specimen, Weymouth's Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Splendrillia adelaidae Powell

Splendrillia adelaidae Powell, 1946, Rec. Auck. Inst. Mus., 3 (1), p. 31, pl. 2, fig. 6.

Diagnosis—A moderately large *Splendrillia* sculptured with 12 vertical axials per whorl which are sharply terminated at the peripheral angle and deeply incised spirals, of which there are six on the spire-whorls and about 26 over the body whorl to the anterior border. Shoulder deeply concave, sub-sutural fold strong.

Dimensions—Height 11.3, diameter 4.25 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll. Auckland Mus., N.Z.

Observations—The species does not occur among material at the writer's disposal.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Genus *SYNTOMODRILLIA* Woodring, 1928

Syntomodrillia Woodring, 1928, Carnegie Inst. Pub., 385, p. 160.

Type species (o.d.) *Drillia lissotropis* Dall.

Syntomodrillia decemcostata (Ludbrook)

Austrodrillia decemcostata Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 98, pl. 5, fig. 19; Crespin, 1943, Min. Res. Surv. Bull., 9, p. 95.

Syntomodrillia decemcostata (Ludbrook), Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 34; Cotton, 1947, Conch. Club S. Aust., 4, p. 11.

Diagnosis—A *Syntomodrillia* of moderate size with protoconch of one-and-a-half globose, smooth turns. Adult whorls angulate on the spire, becoming less so with the age of the whorl. Sculpture of 10 oblique axial costae per whorl, extending from suture to suture and more prominent in the middle of the whorl. Whorls otherwise smooth except for four axial growth striae and six short spiral lirae on the anterior end of the base. Inner lip calloused, parietal callus pad heavy.

Dimensions—Height 7.2, diameter 2.2, height of aperture 2.2 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1672.

Observations—This species also has been recorded from the Kalimnan of Gippsland, it has not occurred in any numbers in any other boring than the Abattoirs.

Material—25 paratypes, Abattoirs Bore; three specimens (two juveniles), Hindmarsh Bore; 1 specimen, Weymouth's Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Syntomodrillia ludbrookae Powell

Syntomodrillia ludbrookae Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 34, pl. 2, fig. 10; Cotton, 1947, Conch. Club S. Aust., 4, p. 11.

Diagnosis—A *Syntomodrillia* of moderate size with a conspicuous, bluntly rounded protoconch of two smooth whorls; adult whorls sculptured with 15-16 axial ribs per whorl, thickened at the middle on the early whorls, narrow crested,

flexuous over the body whorl and dying out over the base. Anterior with five spirals.

Dimensions—Height 7, diameter 2.7 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll. Auck. Mus., N.Z.

Observations—The specimen F 15425 figured (pl. 5, fig. 4) shows a more definite peripheral angle than that described in the holotype. In other respects, however, the specimens from Weymouth's Bore are in agreement with the original description.

Material—The figured hypotype and 4 other specimens.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores.

Genus *TOMOPLEURA* Casey, 1904

Tomopleura Casey, 1904, Trans. Acad. Sci. St. Louis, 14 (5), p. 238.

Type species (o.d.) *Pleurotoma nivae* Philippi.

Tomopleura ludbrookae Powell

pl. 5, fig. 5

Philodrilina dilectoides Chap. & Gab., Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Tomopleura ludbrookae Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 38, pl. 2, fig. 14; Cotton, 1947, Conch. Club S. Aust., 4, p. 11.

Diagnosis—A slender *Tomopleura* with a tall, narrow protoconch of 4 whorls; adult whorls carinate just below the middle, with a strong cord on the carina, two spirals submarginating the suture, two or three threads on the shoulder and 2 strong cords below the carina. Interspaces finely sculptured with closely spaced, flexuous, axial threads. Body whorl with about 23 spirals.

Dimensions—Height 14.9, diameter 4.6 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Material—Hypotype F 15465 and one topotype, Abattoirs Bore; 2 Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bore, Adelaide.

Genus *MAORITOMELLA* Powell, 1942

Maoritomella Powell, 1942, Bull. Auck. Inst. Mus., 2, p. 113.

Type species (o.d.) *Pleurotoma albula* Hutton.

Maoritomella nutans Powell

pl. 5, fig. 6

? *Asthenotoma subtilinia* Hedley, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 100.

Maoritomella nutans Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 39; Cotton, 1947, Conch. Club S. Aust., 4, p. 12.

Diagnosis—A *Maoritomella* of moderate size with a somewhat pagodi form spire. Protoconch large, paucispiral, of two smooth whorls, followed by a half whorl with brephic axials. Adult whorls with a slight carina at the anterior one-fourth, sculptured with four fine lirae above the carina, a spiral cord on the carina, one of equal strength below it, and a third cord emerging from the suture on the body whorl.

Dimensions—Height 12.2, diameter 4.5 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—The two specimens from Abattoirs Bore previously doubtfully referred to *Asthenotoma subtilinea* belong to *Maoritomella nutans*, since described by Powell, and distinguishable largely by the globular paucispiral protoconch from species of *Tomopleura* to which *Maoritomella* is closely related.

Material—Hypotype F 15426 and one topotype, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore.

Subfamily MANGELINAE

Genus GURALEUS Hedley, 1918

Guraleus Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, suppl. p. 31. 79.

Type species (o.d.) *Mangelia picta* Adams & Angas.

Subgenus GURALEUS s. str.

Guraleus (*Guraleus*) *chapplei* Powell

pl. 5, fig. 7

Guraleus chapplei Powell, 1944, Rec. Auck. Mus., 3 (1), p. 47, pl. 4, fig. 1; Cotton, 1947, Conch. Club S. Aust., 4, p. 14.

Diagnosis—An elongate fusiform *Guraleus* with angled whorls sculptured with 10 axials per whorl, extending from upper suture over base. Peripheral angle just above the middle.

Dimensions—Height 12.5, diameter 3.9 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—This species is known to the writer only from a specimen doubtfully identified as such. It is close to the species *G. ludbrookae* from which it differs principally in the number of ribs per whorl, the apparently greater validity of the spirals and in the more elongate shape.

Material—One eroded specimen doubtfully belonging to the species, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Guraleus (*Guraleus*) *ludbrookae* Powell

pl. 5, fig. 8

Guraleus ludbrookae Powell, 1944, Rec. Auck. Mus., 3 (1), p. 47; Cotton, 1947, Conch. Club S. Aust., 4, p. 14.

Diagnosis—An ovate-fusiform *Guraleus* with a polygyrate, dome-shaped protoconch of 3 whorls; shell ovate-fusiform, whorls rounded, sculptured with axials extending from upper suture over base, 12 per whorl. Spirals numerous, thread-like, 4 weak primaries on spire whorls.

Dimensions—Height 7.8, diameter 3 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Material—The figured hypotype F 15427, Hindmarsh Bore; 3 specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Hindmarsh Bores, Adelaide.

Subgenus EUGURALEUS Cotton, 1947

Euguraleus Cotton, 1947, S. Aust. Nat., 24 (3), p. 15.

Type species (o.d.) *Euguraleus anisus* Cotton.

Guraleus (*Euguraleus*) *subnitidus* Ludbrook

Guraleus subnitidus Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 99, pl. 5, fig. 22; Powell, 1944, Rec. Auck. Mus., 3 (1), p. 48.

Euguraleus subnitidus Ludbrook, Cotton, 1947, Conch. Club S. Aust., 4, p. 15.

Diagnosis—A very small *Guraleus* with a polygyrate protoconch of 3 very small, smooth whorls with a minute, exsert tip, followed by one-third whorl with brephic axials. Sculpture of 1 axial ribs per whorl, crossed by spiral grooves, cutting the surface into broad, flat cords, of which there are four from the periphery to the anterior suture. Periphery subangulate.

Dimensions—Height 4.8, diameter 1.8 mm.

Type Locality—Abattoirs Bore, Adelaide.

Material—48 paratypes, Abattoirs Bore; 22 specimens, Weymouth's Bore.

Location of Holotype—Tate Mus. Coll. T 1664.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Guraleus (Euguraleus) adelaidensis Powell

pl. 5, fig. 10

Guraleus adelaidensis Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. ??.

Euguraleus adelaidensis Powell, Cotton, 1947b, Conch. Club S. Aust., 4, p. 15.

Diagnosis—A very small *Guraleus*, with a polygyrate protoconch of 3½ smooth whorls with a minute exert tip, followed by a half whorl of strong, vertical, brephic axials. Whorls carinate at the periphery, sculptured with spiral grooves, cutting the surface into broad, flat cords, of which there are 3 between the periphery and the anterior suture. Axial sculpture of 10 ribs per whorl.

Description of Hypotype—Shell very small, solid, fusiform, with carinate whorls. Protoconch elevated and prominent, polygyrate of 3 smooth whorls with a minute exert tip, followed by a half whorl with brephic axials. Adult whorls 3, carinate at the periphery; suture irregular, impressed. Axial sculpture of 10 strong costae per whorl; spiral sculpture of incised grooves, cutting the surface into flat cords, of which there are three from the periphery to the anterior suture on the whorls, and 19 on the base. There are 5 distinct lirations on the shoulder or sinus area. The uppermost of the three cords on the spire-whorls forms the sharp median peripheral carina. Aperture oblique, of moderate width with a bluntly rounded sinus below the suture. Columella somewhat sinuous; inner lip calloused.

Dimensions of Holotype—Height 4.8, diameter 2.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 16640.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Location of Hypotype—Tate Mus. Coll., F 15428.

Observations—The species is here more fully described from a topotype. It is, as stated in the original description, closely related to *subnitidus*, but differs in shape and in sculpture detail, although the general form of the sculpture is the same in both species.

Material—Figured hypotype and 6 topotypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Guraleus (Euguraleus) powelli sp. nov.

pl. 5, fig. 9

Guraleus cf. *tasmanicus* (T.-Woods) Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A thin, elongate-fusiform *Guraleus* with a polygyrate protoconch of 3 whorls with a minute exert tip, followed by a third whorl with brephic axials; whorls subangulate to convex at the periphery, sculptured with 16 narrow and sharp axials on each whorl which continue from suture to suture on the spire whorls, but die out towards the base on the body-whorl. Sinus area with moderately fine, spiral lirae, remainder of whorl with 7 primary lirae with a very fine secondary thread between.

Description of Holotype—Shell thin, elongate-fusiform, spire high, whorls rounded at the shoulder except in the first two adult whorls, which are subangular. Protoconch large, prominent, polygyrate, of 3 whorls, with a minute exert tip, followed by a third whorl with narrow, nearly vertical brephic axials. Adult whorls 4, sculptured with 16 narrow and sharp axials which are concavely curved in the subsutural or sinus area, extend from suture to suture on the spire-whorls and die out towards the base of the spire-whorls. Sinus area with six moderately fine spiral lirae, rest of whorl with about seven primary lirae with a very fine secondary thread between. Body whorl with about 21 primary lirae from periphery to base and 8 fine linear spaced threads at the neck. Suture deep, impressed. Aperture elongate-pyriform, outer lip thin, columella gently concave, inner lip thinly calloused.

Dimensions—Height 9, diameter 3, height of aperture 5.1 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15429.

Observations—The adult whorls of two species are similarly shaped and sculptured to those of the recent *G. tasmanicus* (Tenison-Woods). The protoconch is, however, larger and more prominent than that of *tasmanicus*.

Material—Holotype and two paratypes, Weymouth's Bore; one paratype, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide.

Guraleus (s.l.) sp.

Observations—A single worn specimen from Weymouth's Bore is not referable to any of the foregoing species. The sculpture is of the type of *G. (E.) subnitidus* and *G. (E.) adelaidensis*, i.e. of spiral grooves, cutting the surface into broad, flat cords. As in *subnitidus*, there are four cords from the periphery to the lower suture. The shell is, however, much more attenuated than *subnitidus* and the whorls are only slightly convex. There are about 12 almost obsolete axial ribs on each whorl.

Subgenus *PARAGURALEUS* Powell, 1944

Paraguraleus Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 49.

Type species (o.d.) *Guraleus (Paraguraleus) balcombensis* Powell.

Guraleus (Paraguraleus) abbreviatus Powell

pl. 5, fig. 12

Guraleus (Paraguraleus) abbreviatus Powell, 1944, Rec. Auck. Inst. Mus., 2 (1), p. 50, pl. 5, fig. 11.

Paraguraleus abbreviatus Powell, Cotton, 1947b, Conch. Club S. Aust., 4, p. 15.

Diagnosis—An ovate-fusiform *Paraguraleus* sculptured with 12-14 axials per whorl and regular, closely-spaced, fine, spiral threads.

Dimensions—Height 5.9, diameter 2.5 mm.

Type Locality—Abattoirs Bore, Adelaide; Dry Creek Sands.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—No examples of this species are known to the writer.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide.

Guraleus (Paraguraleus) incisus Powell

pl. 5, fig. 11

Guraleus (Paraguraleus) incisus Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 51, pl. 5, fig. 14.

Paraguraleus incisus Powell, Cotton, 1947b, Conch. Club S. Aust., 4, p. 15.

Diagnosis—An elongate-fusiform *Paraguraleus* with 13 axial ribs per whorl, crossed by incised spirals cutting the surface into fine threads.

Dimensions—Height 9.8, diameter 3.5 mm.

Type Locality—Abattoirs Bore.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—The dimensions of the figured hypotype are similar to those of the figured paratype measured by Powell; height about 15 mm., diameter 5 mm. The hypotype figured from Hindmarsh Bore is a well-preserved example of this rather elegant species.

Material—Figured hypotype, Hindmarsh Bore, F 15430.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Hindmarsh Bores, Adelaide District.

Guraleus (Paraguraleus) sp.

Observations—A single specimen of *Paraguraleus* from Abattoirs Bore is distinct from any previously described fossil species of *Paraguraleus*. Its sculp-

ture is of the *balcombensis* type, i.e. of narrow primary spiral cords with intermediate threads crossing strong, obliquely curved axials, of which there are eight in the Abattoirs Bore species, in contrast with sixteen per whorl in *balcombensis*. The specimen is somewhat eroded, and complete description is deferred until the species can be confirmed.

Genus MAPPINGIA Ludbrook, 1941

Mappingia Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 99.

Type species (monotypy) *Mappingia acutispira* Ludbrook.

Mappingia acutispira Ludbrook

Mappingia acutispira Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 99, pl. 5, fig. 21; Cotton, 1947, Conch. Club S. Aust., 4, p. 16.

Diagnosis—A small *Mappingia* with a high and conspicuous protoconch of three elevated turns with a small, slightly exsert tip. Adult whorls sculptured with eight oblique axial ribs per whorl, set in sharp relief and stronger on the early whorls and weakening on the body whorls, where they die out on the base. Spiral sculpture of incised grooves cutting the surface into flat cords varying in width but approximately equal to the interspaces on the spire, and well on the base where the grooves are linear. Outer lip with about ten denticles, of which the anterior one is generally larger and more prominent.

Dimensions—Height 5.5, diameter 2 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T 1671.

Material—Six complete and 3 broken paratypes, Abattoirs Bore; 5 complete and 1 broken specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Weymouth's Bores, Adelaide District.

Mappingia matronalis sp. nov.

pl. 5, fig. 15

Diagnosis—A solid and rather stout *Mappingia* with a fairly prominent protoconch of 3 flatly convex turns with a minute, slightly exsert, tip. Adult whorls sculptured with 13 nearly vertical axial ribs per whorl, crossed by narrow, incised grooves, which cut the surface into flat cords, about 8 per whorl on the spire whorls and about 30 on the body whorl. Outer lip fairly thick, with 7 denticles within.

Description of Holotype—Shell elongate-fusiform, solid, rather stout, spire fairly high, whorls convex. Protoconch fairly prominent, of three flatly convex, smooth turns, with a minute, slightly exsert tip, separated by well-marked, fairly deep sutures, followed by a half turn of bryophic axials. Adult whorls 4, rounded and constricted at the sutures, sculptured with 13 axial ribs per whorl, which are nearly vertical and gently curved, crossed by narrow but not linear incised grooves which cut the surface into flat cords about 8 per whorl. The cords bordering both sutures are generally separated by a wider groove than the others. Base with about 30 cords, from suture to anterior, the 10 on the neck being narrower and linear-separated. Body whorl about three-fifths of total height, aperture rather short, outer lip fairly thick, but not markedly thickened at the margins, sinuous in profile, bearing 7 denticles within. Columella concave, anterior canal short, oblique to the left.

Dimensions—Height 7.5, diameter 3, height of aperture 3.3 mm.

Type Locality—Hindmarsh Bore, 450-487 feet.

Location of Holotype—Tate Mus. Coll., F 15431.

Observations—The stouter and more convex appearance of the shell, together with the sculpture, readily serve to separate this shell from the previous. The ribs are never oblique as in *acutispira* and the protoconch is smaller in relation to the adult whorls.

Material—Holotype and four paratypes, Hindmarsh Bore; 6 paratypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs and Hindmarsh Bores, Adelaide District.

Genus *ETREMA* Hedley, 1918

Etrema, Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, supp. p.m. 79.

Type species (o.d.) *Mangilia (Glypostoma) aliviae* Melville & Standen.

Etrema weymouthensis sp. nov.

pl. 5, fig. 16

Diagnosis—A broadly fusiform *Etrema* with inflated whorls and a distinct shoulder. Sculptured with 10 axial folds per whorl; 6 fine spirals on the shoulder and 6 cords of variable width, generally with a secondary thread in the interspace below the periphery on the penultimate whorl. Parietal callus with two denticles.

Description of Holotype—Shell of moderate size, broadly fusiform, whorls inflated, with shoulder well marked and periphery rounded. Protoconch paucispiral of two turns with flattened nucleus, the first globose and the second carinate. Adult whorls 5, depressed on the shoulder, inflated below the shoulder, sculptured with 10 broad axial folds per whorl, spiral sculpture of six fine, flattened, equal lirae on the shoulder and about six cords of variable width, generally with a secondary thread in the interspace, from the periphery to the anterior suture, each cord widened on the summit of the axial folds. Body whorl with six flattened, equal lirae on the shoulder and 20 cords, with a secondary thread of variable width in each interspace, from shoulder to base, and eight fairly wide linear-spaced cords at the anterior end. Aperture widely opened, outer lip thickened with a varix and incurved sinus subquadrangular, broad, fairly deep; columella gently concave, parietal callus with two small denticles; anterior canal oblique and somewhat reflected.

Dimensions—Height 12, diameter 6 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15432.

Observations—This is the Pliocene representative of the *Etrema bidens* group of species which have not as yet been differentiated (Powell, 1944, p. 53). The four examples (G 4202) cited by Harris (1897, p. 59) are separable into two and possibly three species, to none of which does *E. weymouthensis* belong. The holotype of *E. bidens* is in the Australian Museum, Sydney (No. F 1787) and examination should clearly establish the diagnosis of the species.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide District.

Genus *ETREMOPSIS* Powell, 1942

Etrempsopsis Powell, 1942, Bull. Auck. Inst. Mus., 2, p. 151.

Type species (o.d.) *Drillia imperfecta* Suter.

Etrempsopsis contigua Powell

pl. 5, fig. 19

Etrema praespurca Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101, non Chapman & Crespin.

Etrempsopsis contigua Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 55; Cotton, 1947b, Canch. Club S. Aust., 4, p. 18.

Diagnosis—A small *Etrempsopsis* with 9 heavy, broadly rounded axials per whorl, crossed by about 5 fine lirae on the shoulder and about 4 primary cords from the shoulder to the lower suture, with a single intermediate thread in each interspace on the penultimate whorl. Periphery angulate. Aperture with a parietal tubercle.

Description of Hypotype—Shell very small, fusiform, spire tall and turreted. Protoconch tall, polygyrate, broken at the tip in the hypotype, but usually of $4\frac{1}{2}$ whorls with a minute tip; lower whorls carinate in the anterior half and last whorl with strong brepheic axials. Adult whorls 3, carinate at the periphery, sculptured with 9 heavy, broadly rounded axials crossed by about 5 fine spiral lirae on the shoulder and from 2 to 4 primary cords from the shoulder to the lower suture, with a single intermediate secondary thread in each interspace. Eighteen primary cords on the body whorl, the last 8 closely spaced at the anterior. Aperture oblique, with a deep sinus occupying the shoulder; outer lip with a heavy varix. Parietal tubercle conspicuous but not large.

Dimensions—Height 4.3, diameter 2.1 mm.

Dimensions of Holotype—Height 4.1, diameter 2.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Location of Hypotype—Tate Mus. Coll., F15433.

Observations—Sculptured similarly to *Etrema praespurca*, the species is readily distinguishable by its multispiral protoconch, where it is preserved.

Material—Two topotypes, Abattoirs Bore; hypotype and 12 other specimens, Hindmarsh Bore; 2 specimens, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Genus *Filodrillia* Hedley, 1922

Filodrillia Hedley, 1922, Rec. Aust. Mus., 13 (5), p. 220.

Type species (o.d.) *Drillia tricarinata* Tenison-Woods.

Filodrillia peramoena (Ludbrook)

Etrema peramoena Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 99, pl. 5, fig. 23.

Filodrillia peramoena (Ludbrook), Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 56; Cotton, 1947b, Conch. Club S. Aust., 4, p. 18.

Diagnosis—A rather broad *Filodrillia* about twice as high as long, the outline of the whorls being undercut below the strong keel. Sculptured with strong, slender axials, crossing the shoulder, cancellated by spirals of which there are about eight closely set on the shoulder, and two primary strong spirals below the periphery. Intersections sharply nodulose.

Dimensions—Height 4.1, diameter 2.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., T1645.

Observations—This species was established on an immature specimen. The adult specimens now available reach dimensions of height 6.4, diameter 3 mm. There are $4\frac{1}{2}$ adult whorls and the consequent attenuation of the spire clearly places the shell away from the *Etrema*.

Material—Five examples, Weymouth's Bore; one example, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

Filodrillia ludbrookae Powell

pl. 5, fig. 14

Filodrillia ludbrookae Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 57, pl. 5, fig. 9; Cotton, 1947b, Conch. Club S. Aust., 4, p. 18.

Diagnosis—A slender *Filodrillia*, walls undercut on early whorls, but rounded on body whorl; periphery angulate to subangulate. Axials very weak, especially on shoulder; penultimate with 3 spirals below keel.

Dimensions—Height 9, diameter 3.75 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—This species is known to the writer only from a brief inspection of the holotype in Auckland Museum. It is apparently very close indeed

to *F. peramoena*. All specimens examined have the angulate periphery persisting on to the body whorl, and none have the rounded body whorl of *lulbrookae*. The species is more slender than *peramoena*.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Subfamily DAPHNELLINAE

Genus ASPERDAPHNE Hedley, 1922

Asperdaphne Hedley, 1922, Rec. Aust. Mus., 13 (6), p. 338 (*nom. nov.* for *Scabrella* Hedley, 1918, *non* Sacco, 1890).

(*Scabrella* Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, supp. p.M. 79, *non* Sacco, 1890.)

Type species (o.d.) *Daphnella versivestita* Hedley.

Subgenus ASPERTILLA Powell, 1944

Aspertilla Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 60.

Type species (o.d.) *Drillia legrandi* Beddome.

Asperdaphne (*Aspertilla*) *exsculpta* Powell

pl. 5, fig. 13

Asperdaphne (*Aspertilla*) *exsculpta* Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 60, pl. 6, fig. 9.

Aspertilla exsculpta Powell, Cotton, 1947b, Conch. Club S. Aust., 4, p. 22.

Diagnosis—An *Aspertilla* with broad, angulate whorls sculptured with 10 heavy axials per whorl, crossed by sharply raised spiral cords, of which there are three on the spire whorls and six on the body whorl, each interspace with a single interstitial thread. One additional thread on the concave shoulder above the uppermost cord and eight closely-spaced cords on the anterior end.

Dimensions—Height 3.9, diameter 2.15 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Material—Figured hypotype F15434 and one other specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Genus NEPOTILLA Hedley, 1918

Nepotilla Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, supp. p.M. 79.

Type species (o.d.) *Daphnella bathentoma* Verco.

Nepotilla powelli sp. nov.

pl. 6, fig. 22

Diagnosis—A *Nepotilla* with papillate protoconch of two moderately convex turns, sculptured with 8 fine and undulating spiral lirae. Adult whorls strongly carinate, sculptured with 3 elevated, rounded, spiral cords, the median of which on the carina is about twice as strong as the others. Body whorl with a minor cord in the posterior half, major cord on the carina, one fine lira below the carina followed by 2 minor cords, then 15 cords from the top of the aperture to the anterior border.

Description of Holotype—Shell small, solid, slender with strongly carinate whorls, deeply excavated towards the sutures and predominantly spirally sculptured. Protoconch papillate of two moderately convex whorls, the first small with a slightly suppressed tip, sculptured with 8 fine and undulating spiral lirae, abruptly terminated at the junction with the first post-nuclear whorl. Adult whorls 3, strongly medially carinate, sculptured with 3 elevated, rounded, spiral cords, the medial of which on the carina is about twice as strong as those on either side. Body whorl with the major cord on the carina, one minor cord in the posterior half, above and below the carina, one fine lira in the interspace between the major and first minor cord, then 2 minor cords to the

top of the aperture, followed by 15 cords decreasing in strength and increasing in proximity. Interspaces crossed by widely spaced, narrow, fine axial threads. Aperture oblique, elongate, subpyriform, outer lip thin, convex in profile, scalloped by the spiral cords; sinus sutural, fairly deep. Columella concave, anterior canal fairly long and gently oblique.

Dimensions—Height 3.73, diameter 1.65 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15435.

Observations—This species appears to have features in common with both *Nepotilla* and *Asperdaphne* (*Aspertilla*). The protoconch is typically that of *Nepotilla* and is not exert in the manner of *Aspertilla*. The sculpture is predominantly spiral, any clathration being secondarily produced in the interspaces, unlike the strongly clathrate sculpture of *Aspertilla*. The sinus is, however, rather short for *Nepotilla*. The present species is very close to *N. triseriata* Verco, from which it differs in length of sinus and in details of the sculpture.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore.

Genus FENESTRODAPHNE Powell, 1944

Fenestrodaphne Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 60.

Type species (monotypy) *Fenestrodaphne pulchra* Powell.

Fenestrodaphne pulchra Powell

pl. 5, fig. 18.

Fenestrodaphne pulchra Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 61, pl. 6, fig. 10.

Cotton, 1947b, Conch. Club S. Aust., 4, p. 22.

Diagnosis—Shell small, with a paucispiral protoconch of 1½ whorls with tip unrolled, axially costate, crossed by two weak, spiral keels. Adult whorls convex, sculptured with four narrow, primary, spiral cords, with an intermediate thread in each interspace; ten primary cords on the body whorl with one or two threads in the interspaces. Anterior end with 10 linear-spaced cords. Surface fenestrated by closely-spaced axial threads crossing spirals.

Dimensions—Height 6.1, diameter 3 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Genus VEPRECUA Melvill, 1917

Veprecula Melvill, 1917, Proc. Mal. Soc., 11 (4), pp. 141-188.

Type species (o.d.) *Clathurella sykesi* Melvill & Standen.

Veprecula (?) *adelaidensis* Powell

pl. 5, fig. 17.

? *Veprecula adelaidensis* Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 61, pl. 6, fig. 11.

Veprecula adelaidensis Powell, Cotton, 1947b, Conch. Club S. Aust., 4, p. 23.

Diagnosis—A small turrid with a tall, polygyrate, narrowly conic, sinuigerid protoconch, sculptured with delicate cancellations; adult whorls sculptured with eight heavy, vertical axials per whorl and four primary spirals on the spire whorls, 21 altogether on the body whorl; surface cancellated by subsidiary spiral and axial threads. Whorls carinate, the third cord from the posterior forming the peripheral carina.

Dimensions—Height 6.7, diameter 3.5 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., N.Z.

Observations—This species is unknown to the writer except from a brief inspection of the holotype. The genus *Veprecula* is generally limited to depths of from 40 to 156 fathoms in recent waters.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Genus *PSEUDEXOMILUS* Powell, 1944

Pseudexomilus Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 61.

Type species (monotypy) *Pseudexomilus caelatus* Powell.

Pseudexomilus caelatus Powell

pl. 5, fig. 20

Pseudexomilus caelatus Powell, 1944, Rec. Auck. Inst. Mus., 3 (1), p. 62, pl. 6, fig. 12;
Cotton, 1947b, Conch. Club S. Aust., 4, p. 23.

Diagnosis—A tall-spined turrid, Terebra-like with a 2½-whorled, blunt protoconch, tip smooth, remaining two whorls radially costate. Adult whorls sculptured with wavy, spiral cords, crossed by obsolescent axials about 10 per whorl. Sinus descending obliquely from the suture, more or less straight, but narrowly rounded at the apex before descending obliquely forward below the weakly defined shoulder.

Dimensions—Height 11.6, diameter 3.9 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Finlay Coll., Auckland Mus., 12.2.

Observations—This genus and species is unknown to the writer except from a brief inspection of the holotype. The Recent species *Drillia costicapitata* Verco placed by authors in *Filodrillia* appears to belong to the same genus.

Material—Holotype.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Family CONIDAE

Genus *CONUS* Linné, 1758

Conus Linné, 1758, Syst. Nat., ed. 10, p. 712.

Type species (s.d. Children, 1823) *Conus marmoreus* Linné.

Subgenus *FLORACONUS* Iredale, 1930

Floraconus Iredale, 1930b, Mem. Qld. Mus., 10 (1), p. 80.

Type species (o.d.) *Conus anemone* Lamarck.

Conus (Floraconus) adelaidae sp. nov.

pl. 6, fig. 3

Conus hamiltonensis Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101, 1954, *id.*, 77, p. 62 *non* Tate.

Diagnosis—A small *Floraconus*, biconical, with a fairly high gradate spire. Protoconch of moderate size, mamillate, of one-and-a-half turns; adult whorls with 3 spiral threads on the shoulder. Body-whorl smooth, except for 10 punctate spirals, followed by 4 broad spirals, then 4 narrow spirals from about the middle of the whorl to the anterior.

Description of Holotype—Shell small for the genus, biconical, spire fairly high, gradate. Protoconch of moderate size, mamillate, of one-and-a-half turns; adult whorls angulate, with 3 spiral threads on the shoulder. Body whorl conical with straight sides, smooth posteriorly, sculptured from about the middle, with 10 punctate spirals followed by 4 broad spirals, then 4 narrow spirals at the anterior extremity. Aperture rather narrow, attached below the shoulder, outer lip thin, convex in profile.

Dimensions of Holotype—Height 22, diameter 11, length of aperture 17 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., Univ. of Adelaide, F 15436.

Observations—The subgenus has an established lineage in the Australian Tertiary, and occurs throughout Australian waters as well as in the Pacific today.

Material—Holotype and three paratypes, Weymouth's Bore, 310-330 feet; several moulds in calcareous sandstone, outcrop, Section 5, Hundred of Grace.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Family TEREBRIDAE

Genus *STRIOTEREBRUM* Sacco, 1891

Strioterebrum Sacco, 1891, Moll. Terr. Terz. Piem., 10, p. 33.

Type species (o.d.) *Terebra basteroti* Nyst

Subgenus *PERVICACIA* Iredale, 1924

Pervicacia Iredale, 1924, Proc. Linn. Soc. N.S.W., 49 (3), 197, p. 183.

Type species (o.d.) *Terebra ustulata* Deshayes.

Strioterebrum (*Pervicacia*) *crassum* (Tate)

pl. 6, fig. 7

Terebra crassa Tate, 1886b, Southern Science Record, ns. 2 (1), p. 7 (*vide* Tate); 1889, Trans. Roy. Soc. S. Aust., 11, p. 161, pl. 9, fig. 9; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 137.

Diagnosis—Shell with flat whorls, sculptured with 20 axial costae per whorl which are interrupted by a linear sulcus in the posterior-third. Suture slightly impressed—undulating.

Dimensions—About 10 whorls in a length of 17 mm.; diameter of last whorl, 4.5 mm.

Type Locality—Oyster beds, Aldinga Bay, S. Aust.

Location of Holotype—Tate Mus. Coll., T 688C.

Observations—In creating the genus *Pervicacia* Iredale made no reference to the genus *Noditerebra*, created by Cossmann for the Kalimnan *Terebra geniculata* Tate, and synonymized by Wenz with *Pervicacia*, which he reduced to a subgenus of *Strioterebrum* (Wenz, 1943, p. 1481). In the writer's opinion, *Pervicacia* is a well-marked lineage differing from *Noditerebra* in that the sulcus at the posterior-third is generally, though not always, linear. The linear sulcus is similar to that of *Strioterebrum*, which *Pervicacia* closely resembles except for the absence of spiral sculpture. The broad sulcus in *Noditerebra* interrupts the costae to the extent that the upper portion resembles a row of nodules. The protoconch of *Pervicacia* is large and paucispiral, of *Noditerebra* tapering and polygyrate.

Material—Hypotype F 15437 and 12 incomplete specimens, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Aldinga Bay-Abattoirs Bore, Sth. Aust.

Strioterebrum (*Pervicacia*) *subspectabilis* (Tate)

pl. 6, fig. 8

Terebra subspectabilis Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 162, pl. 9, fig. 11; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Euryta subspectabilis Tate, Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 237.

Diagnosis—Shell broad, axially plicate throughout, about 20 stout plicae on penultimate whorl. Plicae interrupted in the posterior-third by a broad shallow sulcus. Protoconch blunt of one-and-a-half turns.

Dimensions—Height 18, diameter 5 mm.

Type Locality—Upper beds, Muddy Creek, Vic.; Kalimnan.

Location of Holotype—Tate Mus. Coll., T 672A.

Observations—It is doubtful whether Abattoirs Bore specimens belong to this species. The ribs are fairly stout, are interrupted by the broad sulcus and the protoconch is typical, but the shell is not so broad as typical specimens of *subspectabilis*. The species is an example of *Pervicacia* in which the posterior sulcus is not linear; in this it resembles *S. (P.) assecla* Iredale.

Material—Hypotype F 15438 and 4 specimens, Abattoirs Bore.

Stratigraphical Range—Kalimnan-Dry Creek Sands.

Geographical Distribution—Western Victoria-Adelaide, Sth. Aust.

Genus *HASTULA* H. & A. Adams, 1853

Hastula H. & A. Adams, 1853, Gen. Rec. Moll., 1, p. 225.

Type species (s.d. Fischer, 1887) *Buccinum strigillata* Linné.

Subgenus *NOTOTEREBRA* Cotton, 1947

Nototerebra Cotton, 1947c, Rec. S. Aust. Mus., 8 (4), p. 667.

Type species (o.d.) *Terebra albida* Gray.

Hastula (*Nototerebra*) *tenisoni* (Finlay)

pl. 6, fig. 9

Terebra simplex Tenison-Woods, 1876, Pap. Roy. Soc. Tas., 1875, p. 21, pl. 2, fig. 1, *non* Conrad, 1830; Tate, 1889, Trans. Roy. Soc. S. Aust., 11, p. 62; Tate & Dennant, 1893, *id.*, 17 (1), p. 221; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), pp. 95, 137; Iredale, 1925, Rec. Aust. Mus., 14 (14), p. 268; Crespin, 1943, Min. Res. Surv. Bull., 9, p. 99; Cotton, 1947, Rec. S. Aust. Mus., 8 (4), pp. 66-7.

Terebra tenisoni Finlay, 1927, Trans. N.Z. Inst., 57, p. 320 (*nomen novum* for *T. simplex* Tenison-Woods).

Terebra angulosa Tate, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—Shell of moderate size for the subgenus with a paucispiral protoconch of 2 convex, smooth turns. Whorls flat with a broad subsutural sulcus developing in the anterior whorls. Sculpture of fine, curved, low axial folds or wrinkles which become obsolete anteriorly. Base gently convex, anterior canal retroflexed.

Dimensions—Height 50, diameter 11 mm.

Type Locality—Table Cape, Tasmania.

Location of Holotype—(?) Royal Society Collection, Hobart, Tasmania.

Observations—Adelaide examples previously placed in the closely-related monotypic and doubtfully separable *angulosa*, appear not to have the diagnostic angular whorls, and are here placed in *H. (N.) tenisoni*, the changed name for which appears to have been overlooked by authors in Australia. The specific name *simplex* has been used several times for *Terebra*, the first of which is that by Conrad. The fossil species differs from the Recent *albida*, type species of the genus, in having more valid axial folds or wrinkles, particularly on the early whorls. In this the species closely resembles species of *Hastula* from the Italian Pliocene. *Hastula* s. str. is validly ribbed on all the whorls, the ribs being linear-separated.

Material—The two fragments figured F 15439 and 3 other fragments, Abattoirs Bore; one fragment, Hindmarsh Bore; 6 hypotypes (Tate) Holotype of *T. angulosa* Tate.

Stratigraphical Range—Oligocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, Sth. Aust.

Terebra (s.l.) sp.

Terebra additoides T.-Woods, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Observations—The three examples identified as *additoides* are fragmentary and worn, and accurate determination is impossible.

Terebra (s.l.) sp.

Terebra sp., Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Observations—Two specimens of an attenuated and possibly smooth *Terebra* from Abattoirs Bore are too eroded to diagnose or describe. The protoconch is large, globose, and paucispiral, the whorls flat and the spire almost straight in profile.

Subclass OPISTHOBRANCHIA

Order BULLOMORPHIA (= Cephalaspidea)

Suborder BULLACEA

Family ACTEONIDAE

Subfamily ACTEONINAE

Genus ACTEON Montfort, 1810

Acteon Montfort, 1810, Couch. Syst., 2, p. 314.

Acteon Goldfuss, 1820, Handb. Zool., 1, p. 681 (for *Acteon* Montfort).

(*Tornatella* Lamarck, 1822, Anim. S. Vert., 6 (2), p. 219.)

(*Speo* Risso, 1826, Hist. Nat. Eur., 4, p. 235.)

Type species (monotypy) *Voluta tornatilis* Linné.

Acteon scrobiculatus Tenison Woods

pl. 6, fig. 11

Acteon scrobiculatus Tenison Woods, 1877, Pap. Roy. Soc. Tas. for 1876, p. 102.

Acteon scrobiculatus Tenison Woods, Harris, 1897, Cat. Tert. Moll. Brit. Mus., 1, p. 7; Cossmann, 1897, Trans. Roy. Soc. S. Aust., 21, p. 1, pl. 1, figs. 1-3; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 95; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Tornatella scrobiculata T.-Woods, Dennant, 1889, Trans. Roy. Soc. S. Aust., 11, p. 48; Tate & Dennant, 1893, Trans. Roy. Soc. S. Aust., 17, p. 223.

Diagnosis—A small *Acteon* with a smooth protoconch of one-and-a-half whorls, the tip prominent and heterostrophic. Adult whorls 5; body-whorl large, four-fifths height of shell, moderately convex and rather narrow. Sculpture of spiral grooves, the hollows of which are crossed by fine growth lamellae; 4 grooves on the penultimate and about 30 with occasional secondary grooves between on the body-whorl. Columella with a long, thick, oblique fold anteriorly, above which it is excavate.

Dimensions of Holotype—Height 6, diameter 6, height of aperture 6 mm.

Dimensions of Hypotype (Table Cape)—Height 8, diameter 3.75 mm.

Type Locality—Table Cape, Tasmania-Janjukian.

Location of Holotype—(?) Royal Society Collection, Hobart, Tas.

Location of Hypotype (Table Cape)—Cossmann Collection, Sorbonne, Paris.

Location of Hypotype (Muddy Creek, Harris, 1897)—B.M. Coll., G 4296.

Location of Hypotype (Hindmarsh Bore)—Tate Mus. Coll., F 15440.

Observations—Specimens from Hindmarsh Bore are identical with the hypotype from Muddy Creek in the British Museum. The species is apparently very long-ranging and widely distributed.

Material—The figured hypotype and 6 other specimens, Hindmarsh Bore; 2 specimens, Weymouth's Bore; hypotype, B.M. Coll. G 4296, fig'd Harris, 1897; 1 specimen, G 39559, Muddy Creek, Kalimnan, B.M. Coll.

Stratigraphical Range—? Oligocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Acteon sp.

Observations—A single specimen from Weymouth's Bore of a stout *Acteon* with the anterior portion of the outer lip broken. It is closely related to *A. diana* Adams from Japan, but complete diagnosis is deferred until further material is available.

GENUS SEMIACTEON Cossmann, 1889

Semiactaeon Cossmann, 1889, Ann. Soc. Mal. Belg., 24, p. 304.

Type species (monotypy) *Actaeon sphaericulus* Deshayes.

Semiactaeon tardior sp. nov.

pl. 6, fig. 12

Semiactaeon microplocus Cossmann, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101 (pars.).

Diagnosis—A small *Semiactaeon* with markedly constricted and narrowly canaliculate sutures; whorls sculptured with about 6 spiral grooves cutting the surface into flat cords generally wider than the grooves. Grooves crossed by frequent axial growth lamellae, which are crowded and not spaced so as to produce a cancellated groove, as in *S. microplocus*. Outer lip convex, oblique to the right in profile. Body-whorl constricted towards the umbilicus.

Description of Holotype—Shell small, ovate-conical, whorls convex, spire moderate, body-whorl fairly large, three-quarters height of shell. Protoconch smooth, of one-and-a-half turns, tip heterostrophic; adult whorls 3, convex, separated by fairly narrow, canaliculate sutures towards which the whorl is

constricted anteriorly; sculpture of 6 spiral grooves, one bordering the suture, on each whorl and about 18 continuing over the body-whorl from suture to base. Grooves crossed by frequent crowded growth lamellae. Body-whorl convex, rather sharply constricted towards the umbilicus. Aperture ovate, outer lip narrowly incurved towards the suture and attached at right angles to the body-whorl, about three-sevenths the distance up the whorl, oblique to the right in profile, bevelled within, crenulated by the spire sculpture on the margin; aperture narrowly rounded and somewhat everted below. Columella with a small fold medially, callus narrow and rather thin, slightly turned over the umbilical opening.

Dimensions—Height 6, diameter 3.2, height of aperture 3.1 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., F 15441.

Observations—This species is very close to *S. microplocus* Cossmann, with which it was formerly identified. It is, however, differently shaped. The body-whorl is more roundly convex and more sharply constricted towards the umbilicus. The spire whorls are more deeply constricted anteriorly. The sculpture of the grooves differs from that of *S. microplocus* which is cancellate as a result of the wide spacing of the axial lamellae of growth. There appear to be more spiral grooves on each whorl in the species *S. tardior*.

Material—Holotype, 11 topotypes and 3 fragments, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Semiactaeon stratosculptus sp. nov.

pl. 6, fig. 13

Semiactaeon microplocus Cossmann, Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101 (pars.).

Diagnosis—A small *Semiactaeon* with a rather high spire and body-whorl of moderate size only. Shell more gradually increasing than *tardior*, whorls moderately convex, sculptured with 10 fine spiral grooves per whorl, 25 continuing over the body-whorl from suture to base. Body-whorl not markedly constricted to the umbilicus.

Description of Holotype—Shell small, elongate-oval, whorls moderately convex, spire fairly high. Body-whorl of moderate size, about two-thirds height of shell; protoconch smooth of one-and-a-half turns; tip heterostrophic; adult whorls 3, convex, separated by impressed but not markedly canaliculate sutures; whorls sculptured with fine spiral grooves, 10 per whorl on the spire whorls, and 25 continuing over the body-whorl from suture to base; microscopic axial growth lamellae crossing the grooves. Body-whorl moderately convex from suture to anterior, not markedly constricted towards the umbilicus. Aperture ovate, outer lip convex, oblique to the right in profile, rather thin; columella with a small fold medially, callus narrow; aperture narrowly rounded and somewhat everted below.

Dimensions—Height 6, diameter 3, height of aperture 3 mm.

Type Locality—Abattoirs Bore, Adelaide.

Location of Holotype—Tate Mus. Coll., F 15442.

Material—Holotype and 2 paratypes, Abattoirs Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Abattoirs Bore, Adelaide District.

Family RETUSIDAE

Genus RETUSA Brown, 1827

Retusa Brown, 1827, Ill. Conch. G.B. & L., pl. 38, fig. 1.

Type species (s.d. Gray, 1847) *Retusa obtusa* Brown = *Voluta alba* Kanmacher.

Subgenus SEMIRETUSA Thiele, 1925

Semiretusa Thiele, 1925, Wiss. Ergebn. Deutsch. Tiefsee Exped., 17 (2), Gast., 2, p. 258.

Type species (s.d. Thiele, 1931) *Retusa bornensis* Adams.

***Retusa (Semiretusa) canaligradata* sp. nov.**

pl. 6, fig. 15

Retusa longispira (Cossn.) Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A small, fragile *Semiretusa* with a gradate spire about one-tenth height of shell. Adult whorls 3, broadly channelled on the shoulder with a rim-like border at the periphery and at the suture. Periphery sharply angulate. Columella with a thin callus, without plaits.

Description of Holotype—Shell very small, thin, fragile, subcylindrical, spire gradate, body-whorl high, nearly nine-tenths height of shell. Protoconch slightly broken in the holotype; adult whorls 3, broadly channelled on the shoulder with bordering rim at the suture and at the periphery. Periphery sharply angulate. Body-whorl subcylindrical. Contracted posteriorly above the level of the aperture, and in the anterior one-third. Aperture elongate, margins parallel in the posterior half, widening and roundly expanding anteriorly. Outer lip thin, nearly straight, convex in profile, channelled at its junction with the parietal wall, well below the top of the whorl. Columella short, concave, without folds, columellar callus thin, parietal callus absent.

Dimensions—Height 7.5, diameter 3.0, height of body whorl 6.75 mm.

Paratype—A juvenile, showing heterostrophic protoconch set practically vertical of one-and-a-half turns with very small nucleus.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15443.

Observations—Some juvenile specimens of this species closely resemble Cossmann's figure of *Tornatina longispira*, but comparison of adults with undoubted adults of *longispira* sufficiently establishes that there is no close resemblance between the two. The canalliculate shoulder and absence of columellar fold are diagnostic of the species here described. The subgenus is typically Indo-Pacific.

Material—Holotype, 11 paratypes, Weymouth's Bore; 14 paratypes, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Adelaide District.

***Retusa (Semiretusa) apiculata* (Tate)**

pl. 6, fig. 16

Utriculus apiculatus Tate, 1879, Trans. Phil. Soc. S. Aust. for 1878-9, p. 138, pl. 15, fig. 3.

Retusa apiculata Tate, Cotton & Godfrey, 1933a, S. Aust. Nat., 14 (3), p. 75; Cotton & Godfrey, 1938, Mal. Soc. S. Aust., 1, p. 32; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A large *Retusa* with a sunken spire and papillary protoconch exerted beyond the level of the body-whorl. Upper part of body-whorl convex, lower part tapering. Columella with a weak plait at the anterior extremity.

Description of Hypotype (Weymouth's Bore)—Shell fairly large, subrectangular. Spire sunken, top of shell flat, with a papillary protoconch projecting above the level of the body-whorl. Adult whorls 4, spire quite flat with linear suture, whorls sculptured between the sutures with crowded axial growth striae. Body whorl equal to height of shell except for protoconch, outlines straight but tapering gradually in the anterior one-third. Aperture elongate, margins parallel in the posterior half, gradually expanding anteriorly, everted at the anterior. Columella oblique, with a straight fold at the anterior end. Columellar callus thin.

Dimensions—Height 6, diameter 2.7 mm.

Dimensions of Holotype—Height 15.5, diameter 7 mm.

Type Locality—King George Sound, W. Aust.; Recent.

Location of Holotype—S. Aust. Mus.

Observations—Pliocene specimens are smaller and more rectangular at the shoulder than the typical Recent shell, but are the same in other respects.

Material—Hypotype F 15444, and 12 other specimens, Weymouth's Bore; 6 specimens, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands; Recent.

Geographical Distribution—South Australia to Western Australia.

***Retusa (Semiretusa) coxi* sp. nov.**

pl. 6, fig. 21

Diagnosis—A large *Semiretusa* with a sunken spire and small protoconch, visible at the bottom of the apical depression. Whorls visible in apical depression, each whorl embracing previous whorl; sculpture between the whorls concave axial accretional striae. Body whorl larger than rest of shell, last half of whorl protruding above level of first half. Columella with a moderate fold.

Description of Holotype—Shell large for the subgenus, subrectangular, spire sunken and somewhat gradate, each whorl larger than previous. At bottom of apical depression the small globose protoconch is visible. Body whorl larger than rest of shell, increasing in height so that the last half of the whorl protrudes above the level of the first half. Whorls turned over towards the suture and sculptured in the depressed portion with concave axial accretional striae following the outline of the posterior sinus of the aperture. Body whorl smooth, except for growth striae which converge on the base. Aperture elongate, extending beyond the suture of the body whorl and reflected in a narrow concave sinus outer lip convex in profile, parallel to the whorl in the posterior two-thirds expanding ovately in the anterior third; columella short, with a moderate plait situated rather high; columellar border calloused, rather thin and joined to the body-whorl at the top of the curve of the base.

Dimension—Height 9.5, diameter 3.5 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15445.

Observations—The more sunken spire with the protoconch not protruding above the level of the spire easily distinguishes this species from *R. (S.) apiculata* (Tate). It is named in honour of Dr. L. R. Cox of the British Museum (Natural History).

Material—Holotype and 5 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide District.

Genus VOLVULELLA R. B. Newton, 1891

Volvulella R. B. Newton, 1891, Syst. List Brit. Olig. Eoc. Moll., p. 268, *nom. nov.* for *Volcula* Adams *non* Gistl.

(*Volcula* Adams, 1850, in Sowerby, Thes. Conch., 2 (11), p. 558, *non* Gistl, 1848.)

(*Volvullella* Bucquoy, Dautzenberg & Dollfus, 1898, Moll. Mar. Rouss., 2, p. 774, *err. pro* *Volvulella* Newton.)

***Volvulella rostrata* (Adams)**

pl. 6, fig. 17

Bulla (Volvula) rostrata Adams, 1850, in Sowerby, Thes. Conch., 2, p. 596, pl. 125, fig. 154; Tate, 1890a, Trans. Roy. Soc. S. Aust., 13 (2), p. 177.

Volvula rostrata Adams, Pilsbry, 1893, in Tryon Man. Conch., 15, p. 241, pl. 26, fig. 60; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 142.

Rhizorus rostratus Adams, Hedley, 1903, Mem. Aust. Mus., 4, p. 395, fig. 110; Hedley, 1918, Journ. Roy. Soc. N.S.W., 51, supp. p.M., 103; May, 1921, Check List Moll. Tas., p. 103; May, 1923, 111, Ind., p. 97, pl. 46, fig. 9; Cotton & Godfrey, 1933a, S. Aust. Nat., 14 (3), p. 78.

Volvulella rostrata Adams, Cotton & Godfrey, 1938, Mal. Soc. S. Aust., 1, p. 33; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A *Volvulella* of moderate size, contracted and narrowly perforate at the summit with long, narrow aperture, the margins parallel over most of the distance, raised above the summit posteriorly and narrowly expanding anteriorly. Base perforate, columella short with a single fold.

Dimensions—Height 4, diameter 1.5 mm.

Type Locality—Port Lincoln, S. Aust.; Recent.

Location of Holotype—B.M. Coll., 1951/10/9/ 1-2.

Material—Holotype and one paratype; figured hypotype F 15446 and 8 other specimens, Abattoirs Bore; 1 specimen, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands-Recent.

Geographical Distribution—N.S.W. to Western Australia.

Family SCAPHANDRIDAE

Genus CYLICHNA Loven, 1846

Cylichna Loven, 1846, Ofvers. K. Vetensk. Akad. Förh., Stockholm, 3 (5), p. 142.

(*Bullina* Risso, 1826, Hist. Nat. Eur. Merid., 4, p. 51, non Ferussac, 1822.)

(*Cylindrella* Swainson, 1840, Treat. Malac., p. 311, non Pfeiffer, 1840.)

(*Cyclina* Gray, 1857, Guide Moll. Brit. Mus., p. 195, non Deshayes, 1850.)

(*Bullina* R. B. Newton, 1891, Syst. List. Brit. Olig. & Eoc. Moll., p. 265, nom. nov. for *Bullina* Risso & *Cylichna* Loven.)

(*Adamnestia* Iredale, 1936, Rec. Aust. Mus., 19 (5), p. 333.)

Type species (s.d. Bucquoy, Dautzenberg, & Dollfus, 1886)

Bulla cylindricea Pennant.

Cylichna angustata (Tate & Cossmann)

pl. 6, fig. 18

Bullinella angustata Tate & Cossmann, 1897, in Cossmann, Trans. Roy. Soc. S. Aust., 21, p. 11, pl. 1, figs. 1, 2; Dennant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 95.

Cylindrella angustata Tate & Coss., sp. Chapman, Cressin & Keble, 1928, *id.*, 5 (1), p. 168; Cressin, 1943, Min. Res. Surv. Bull., 9, p. 96.

Cylchnella cf. *angustata* (Tate & Cossn.), Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A *Cylichna* of moderate size, very narrow, summit truncated and previous whorls visible to some extent down a narrow perforation. Body-whorl completely embracing all the shell, sculptured with spiral striae which frequently alternate in relative strength, a little deeper at the extremities than in the middle. Columella with a slight anterior fold.

Dimensions—Height 10.5, diameter 4 mm.

Type Locality—Adelaide.

Location of Holotype—Cossmann Coll., Sorbonne, Paris.

Observations—The reference of this and other Australian species to *Cylchnella* is incorrect. *Cylchnella* has a long columella with 2 folds, one anterior and one posterior. Marwick (1931, p. 153) has already observed the *Cylchnella*-type columella in the Recent Australian *C. thetidis*. The genus *Adamnestia* was introduced monotypically for a species *A. peroniana* Iredale almost with description. On shell characters it is inseparable from *Cylchnella*.

Material—The figured hypotype F 15447 and 20 specimens, Weymouth's Bore; 16 specimens, all juveniles, Hindmarsh Bore.

Stratigraphical Range—Tertiary.

Geographical Distribution—Gippsland, Vic.-Adelaide, Sth. Aust.

Cylichna anticingulata sp. nov.

pl. 6, fig. 19

Cylchnella cuneopsis Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101.

Diagnosis—A small *Cylichna*, cylindro-conical, funnel-shaped, truncated posteriorly and perforated at the apex. Conical posteriorly, ovaly rounded anteriorly. Aperture narrow over posterior two-thirds of its length. Shell smooth except for 8 spiral striations on the base.

Description of Holotype—Shell small, cylindro-conical, funnel-shaped, truncated posteriorly and perforated at the apex; perforation deep and narrow, showing the convolutions. Body-whorl embracing the shell, elongate-ovate. Aperture longer than the whorl, narrow, with margins parallel over the posterior two-thirds, suddenly expanding into an oval shape at the anterior; rounded at the anterior margin. Outer lip thin, incurved narrowly over most of its length, curving over in a narrow arc at the posterior end. Columella short, without

plaits, columella margin narrow, curved. Surface of shell smooth except for six conspicuous spiral striations on the base.

Dimensions—Height 6, diameter 2.7 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15448.

Observations—The Miocene species *C. cuneopsis* to which Adelaide specimens were formerly referred is slightly broader than *anticingulata*, which may be at once distinguished by the well-marked striae on the base.

Material—Holotype and 8 paratypes, Weymouth's Bore; 1 paratype, Hindmarsh Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Hindmarsh and Weymouth's Bores, Adelaide.

Genus DAMONIELLA Iredale, 1918

Damoniella Iredale, 1918, Proc. Mal. Soc., 18, p. 37, *nom. nov.* for *Roxania* Gray, *non* Turton, 1834.

(*Roxania* Gray, 1847, Proc. Zool. Soc., 15, p. 161.)

Type species (o.d.) *Bulla cranchi* Fleming.

Damoniella bullaeformis (Cossmann)

pl. 6, fig. 20

Roxania (?) *bullaeformis* Cossmann, 1897, Trans. Roy. Soc. S. Aust., 21, p. 17, pl. 2, figs. 21, 22; Demant & Kitson, 1903, Rec. Geol. Surv. Vic., 1 (2), p. 95; Ludbrook, 1941, Trans. Roy. Soc. S. Aust., 65 (1), p. 101; Crespiu, 1943, Min. Res. Surv. Bull., 9, p. 98.

Diagnosis—A small, solid *Damoniella* with a moderately narrow and smooth apical funnel-like depression and an open umbilical perforation. Sculpture of concise spiral striations over all the shell, generally deeper at the extremities. Outer lip thick, bevelled within.

Dimensions—Length 4.25, diameter 2.5 mm.

Type Locality—Lower beds, Muddy Creek; Miocene.

Location of Holotype—Cossmann Collection, Sorbonne, Paris.

Observations—This species appears to be rare. It has been previously recorded only from the type locality and from the Kalimnan of Gippsland. The synonymy of the genus *Damoniella* is revised above. The name was introduced by Iredale as a *nom. nov.* for *Roxania* Gray, which he considered a homonym of *Roxana* Stephens. It is not a homonym of *Roxana* which is spelt differently, but of *Roxania* introduced in synonymy by Turton (ex Leach) for *Bulla hyalina* Turton, now placed in synonymy with *Diaphana minuta* Brown.

Material—The figured hypotype F 15449 and 6 other specimens, Weymouth's Bore; 5 specimens, Hindmarsh Bore.

Stratigraphical Range—Miocene to Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, S. Aust.

Damoniella partisculpta sp. nov.

pl. 6, fig. 14

Diagnosis—A fragile, thin *Damoniella* of moderate size, sculptured with about 14 incised spiral striae at both the anterior and posterior of the body whorl with a smooth band between.

Description of Holotype—Shell of moderate size, fragile, thin, ovoid, ventricose. Apex with a narrow, funnel-shaped perforation. Body-whorl embracing all the shell, broadly contracted posteriorly and more gradually contracted anteriorly towards the umbilical cavity. Surface sculptured with about 14 incised spiral striae at both the posterior and anterior, the striae generally being more closely spaced towards the extremities. Middle of the whorl smooth, without spiral striae. Aperture longer than whorl, arcuate, produced into a quadrately rounded arc at the posterior parallel to the inner margin over nearly two-thirds of its length, then gradually expanding to the narrowly-rounded, anterior border. Outer lip somewhat thickened, bevelled within; columella

with a slight twist, short; columellar callus short, joined to the base of the body whorl and not extending over the base of the whorl.

Dimensions—Height 7.5, diameter 4.65 mm.

Type Locality—Weymouth's Bore, 310-330 feet.

Location of Holotype—Tate Mus. Coll., F 15450.

Material—Holotype and portions of 5 paratypes, Weymouth's Bore.

Stratigraphical Range—Dry Creek Sands.

Geographical Distribution—Weymouth's Bore, Adelaide.

Genus SCAPHANDER Montfort, 1810

Scaphander Montfort, 1810, *Conch. Syst.*, 2, p. 334.

Type species (monotypy) *Bulla lignaria* Linné.

Scaphander tenuis Harris

Scaphander tenuis Harris, 1897 (March), *Cat. Tert. Moll. Brit. Mus.*, 1, p. 12, pl. 1, figs. 4 a-c; Dennant & Kitson, 1903, *Rec. Geol. Surv. Vic.*, 1 (2), p. 98.

Scaphander tatei Cossmann, 1897, *Trans. Roy. Soc. S. Aust.*, 21, p. 9, pl. 1, figs. 34, 35; Ludbrook, 1941, *Trans. Roy. Soc. S. Aust.*, 65 (1), p. 101; Crespin, 1943, *Min. Res. Surv. Bull.*, 9, p. 98.

Diagnosis—A *Scaphander* of moderate size, with a thin test and a small but deep apical umbilicus. Surface sculptured with deep, fine growth striae with occasional fine striae in the intervals. Aperture large and open, constricted posteriorly, rapidly dilating anteriorly.

Dimensions—Height 13.5, diameter 7 mm.

Type Locality—Muddy Creek, Victoria, Lower beds; Miocene.

Location of Holotype—B.M. Coll., G 4171.

Material—Holotype and 3 broken paratypes, G 4171, 5 topotypes, G 39185-9, B.M. Coll.; 8 damaged specimens, Abattoirs Bore.

Stratigraphical Range—Miocene-Dry Creek Sands.

Geographical Distribution—Gippsland, Vic.-Adelaide, Sth. Aust.

REFERENCES

(Only references which were not cited in Part IV—*Turritellidae* to *Struthiolariidae*—are included.)

- ADAMS, A., 1850, in Sowerby, G. B., *Thesaurus Conchyliorum*, 2.
ANGAS, G. F., 1869. Descriptions of twelve new species of Land and Marine Shells from Australia and the Solomon Islands. *Proc. Zool. Soc.*, pp. 45-49, pl. 2.
BLAINVILLE, H. M. D. DE, 1826, in *Dictionnaire des Sciences naturelles* (ed. 2), 42.
BROWN, T., 1827. Illustrations of the Conchology of Great Britain and Ireland.
BRÜNNICH, T., 1772. *Zoologiae Fundamenta*.
CHAPMAN, F., 1916. Cainozoic Geology of the Mallee and other Victorian Bores. *Rec. Geol. Surv. Vic.*, 3 (4), pp. 327-430.
CHAPMAN, F., and CRESPIN, L., 1933. New and Rare Tertiary Mollusca from Deep Borings in Gippsland, Victoria. *Trans. Roy. Soc. Vic.*, 46 (1) (n.s.), pp. 66-76, pl. 5.
CHAPMAN, F., and GABRIEL, C. J., 1914. Description of New and Rare Fossils obtained by Deep Boring in the Mallee. Part 2. Mollusca. *Proc. Roy. Soc. Vic.*, 26 (2) (n.s.), pp. 301-330, pls. 24-28.
COSSMANN, M., 1889a. Catalogue Illustré des Coquilles Fossiles de l'Eocene des Environs de Paris. *Ann. Soc. Roy. Malac. Belg.*, 24, pp. 3-381.
COSSMANN, M., 1889b. Gastéropodes, in Carez & Douville, *Annuaire Géologique Universel*, Paris, 5, p. 1090.
COSSMANN, M., 1897. The Gastropods of the Older Tertiary of Australia—Les Opisthobranches. *Trans. Roy. Soc. S. Aust.*, 21, pp. 1-21, pls. 1-2.
COSSMANN, M., 1908. *Essais de Paléconchologie comparée*, 5.
COSSMANN, M., 1921. Rectifications de Nomenclature *Revue Critique de Paléozoologie*, 25 (2), pp. 79-80.
COTTON, B. C., 1947a. Some South Australian Turridae. *South Aust. Nat.*, 24 (3), pp. 13-16.
COTTON, B. C., 1947b. Australian Recent and Tertiary Turridae. *Field Nat. Sec., Roy. Soc. S. Aust. Conch. Club*, Pub. 4.
COTTON, B. C., 1947c. Some Tertiary Fossil Molluscs from the Adelaidean Stage (Pliocene) of South Australia. *Rec. S. Aust. Mus.*, 8 (4), pp. 653-670.

- COTTON, B. C., 1949a. Australian Recent and Tertiary Mollusca. Family Volutidae. Rec. S. Aust. Mus., 9 (2), pp. 181-196, pls. 13-16.
- COTTON, B. C., 1949b. Australian Recent and Tertiary Mollusca. Family Marginellidae. Rec. S. Aust. Mus., 9 (2), pp. 197-224, pls. 17-20.
- COTTON, B. C., and GODFREY, F. K., 1931. South Australian Shells. Part 2. S. Aust. Nat., 13 (1), pp. 5-23.
- COTTON, B. C., and GODFREY, F. K., 1933a. South Australian Shells. Part 7. S. Aust. Nat., 14 (3), pp. 72-108.
- COTTON, B. C., and WOODS, N. H., 1933. Remarks on the New Harpid (Mollusca) Genera of Finlay and Iredale. Rec. S. Aust. Mus., 5 (1), pp. 45-47.
- DALL, W. H., 1915. A Monograph of the Molluscan Fauna of the Orthaulax pugnax zone of the Oligocene of Tampa, Florida. Bull. U.S. Nat. Mus., 90, 173 pp., 26 pls.
- DENNANT, J., 1889. Notes on the Muddy Creek Beds, with brief Remarks on other Tertiary Strata of South-Western Victoria. Trans. Roy. Soc. S. Aust., 1887-8, 11 pp. 30-39.
- DUMÉRIL, A. M. C., 1806. Zoologie Analytique.
- ETHERIDGE, R., jun., 1878. A Catalogue of Australian Fossils. Camb. Univ. Press.
- FINLAY, H. J., and MARWICK, J., 1937. The Wangaloan and Associated Molluscan Faunas of Kaitangata-Green Island Subdivision, N.Z. Dept. Sci. Ind. Res. Geol. Surv. Branch Pal. Bull., 15.
- GABB, W. M., 1876. Notes on American Cretaceous Fossils, with Descriptions of some new species. Proc. Acad. Nat. Sci. Philad., pp. 276-324, pl. 17.
- GOLDFUSS, G. A., 1820. Handbuch der Zoologie, 1.
- GRANT, U. S., and GALE, H. R., 1931. Catalogue of the Marine Pliocene and Pleistocene Mollusca of California. Mem. San Diego Soc. Nat. Hist., 1.
- GRAY, J. E., 1834, in Griffith's Cuvier. The Animal Kingdom. Mollusca and Radiata.
- GRAY, J. E., 1840. Synopsis of the Contents of the British Museum, ed. 42.
- GRAY, J. E., 1855. Observations on the Species of Volutes-Volutidae. Proc. Zool. Soc., 23, pp. 50-65.
- GRAY, J. E., 1857. Guide to the Systematic Distribution of the Mollusca in the British Museum. Part 1.
- GUILDING, J., 1837. Observations on Naticina and Dentalium two Genera of Molluscan Animals. Trans. Linn. Soc. Lond., 17, pp. 29-35.
- HEDLEY, C., 1902. Studies on Australian Mollusca. Part VI. Proc. Linn. Soc. N.S.W., 27 (1), 105, pp. 7-29, pls. 1-3.
- HEDLEY, C., 1902-3. Scientific Results Trawling Expedition H.M.C.S. Thetis off the Coast of New South Wales. Mollusca. Mem. 4, parts 5 and 6, Aust. Mus., Sydney.
- HEDLEY, C., 1922. A revision of the Australian Turridae. Rec. Aust. Mus., 13 (6), pp. 213-359, pls. 42-56.
- HERRMANNSEN, A. N., 1846. Indicis Generum Malacozoorum, 1.
- IREDALE, T., 1915. Commentary on Suter's Manual. Trans. N.Z. Inst., 47, pp. 417-497.
- IREDALE, T., 1918. Molluscan Nomenclatural Problems and Solutions. No. 1. Proc. Malac. Soc., 13 (1), pp. 28-40.
- IREDALE, T., 1927a. A Review of Australian Helmet Shells. Rec. Aust. Mus., 15 (5), pp. 321-354, pls. 31-32.
- IREDALE, T., 1929b. Strange Molluscs in Sydney Harbour. Aust. Zool., 5 (4), pp. 337-352.
- IREDALE, T., 1929c. Mollusca from the Continental Shelf of Eastern Australia. Rec. Aust. Mus., 17 (4), pp. 158-189.
- IREDALE, T., 1930. Queensland Molluscan Notes, No. 2. Mem. Qld. Mus., 10 (1), pp. 73-88, pl. 9.
- IREDALE, T., 1931. Australian Molluscan Notes, No. 1. Rec. Aust. Mus., 18 (4), pp. 201-235, pls. 22-25.
- JOHNSTON, R. M., 1877. Further Notes on the Tertiary Marine Beds of Table Cape. Proc. Roy. Soc. Tas. for 1876, pp. 79-90.
- JOHNSTON, R. M., 1888. Systematic Account of the Geology of Tasmania, pp. xxii, 408, 80 pls. 4to. Hobart.
- JOUSSEAUME, F., 1880. Division Méthodique de la Famille des Purpurides. Le Nat., 1 (42), pp. 335-6.
- JOUSSEAUME, F., 1884. Étude sur la Famille des Cypracidae. Bull. Soc. Zool. de France, 19, pp. 81-100.
- JOUSSEAUME, F., 1888. Description des Mollusques Recueillis par M. le Dr. Faurot dans le Mex Rouge et le Golfe d'Aden. Mem. Soc. Zool. de France, 1, pp. 165-223.
- KESTIVEN, H. L., 1902. Notes on Prosobranchiata No. 1—Lotorium. Proc. Linn. Soc. N.S.W., 27 (3), 107, pp. 443-483, pl. 17.
- KESTIVEN, H. L., 1912. The Constitution of the Gastropod Protoconch: Its Value as a Taxonomic Feature and the Significance of some of its Forms. Proc. Linn. Soc. N.S.W., 37 (1), 145, pp. 49-82, pl. 1.
- LEACH, W. E., 1852. A Synopsis of the Mollusca of Great Britain.
- LINK, D. H. F., 1807. Beschreibung der Naturalien= Sammlung der Universität zu Rostock, (3), May, pp. 101-165.

- LOWEN, S. L., 1846. Index Molluscorum litora Scandinaviae occidentalia habitantium. *Öfvers. Kongl. Vetensk. -Akad. Förh.*, 3 (5), pp. 135-160.
- MAITZAN, F. VON, 1880. Eine neue Molluskengattung. *Nachr. deuts. Malak. Gesells.*, 12 (10), pp. 106-109.
- MARTENS, E. C. VON, 1903. Wissenschaftliche Ergebnisse der Deutschen Tiefsee Expedition auf dem Dampfer "Valdivia" 1898-1899. Die beschalteten Gastropoden 1903-1904.
- MARWICK, J., 1924b. An Examination of some of the Tertiary Mollusca claimed to be common to Australia and New Zealand. *Rep. Aust. Assoc. Adv. Sci.*, 16, pp. 316-331.
- MELVILL, J. C., 1916. Notes on the Genus *Harpa*. *Journ. Conch.*, 15 (1), pp. 25-32; 15 (2), pp. 33-40.
- MELVILL, J. C., 1917. A Revision of the Turridae (Pleurotomidae) occurring in the Persian Gulf, Gulf of Oman and North Arabian Sea, as evidenced mostly through the results of the dredgings carried out by Mr. F. W. Townsend, 1893-1911. *Proc. Malac. Soc.*, 12 (4), pp. 140-201, pls. 8-10.
- MENKE, C. T., 1830. *Synopsis methodica Molluscorum*, ed. 2.
- MONTEROSATO, T. A. DI, 1917. Molluschi viventi e quaternari raccolti lungo le coste della Tripolitania. *Boll. Soc. Zool. Ital.*, ser. 3, 4.
- NEWTON, R. B., 1891. A Systematic List of the Frederick E. Edwards Collection of British Oligocene and Eocene Mollusca in the British Museum (Natural History).
- PHILIPPS, R. A., 1853. *Handbuch der Conchyliologie und Malacozoologie*.
- PILSBURY, H. A., 1893. *Tryon's Manual of Conchology*, 15.
- POWELL, A. W. B., 1933. Notes on the Taxonomy of the Recent Cymatidae and Naticidae of New Zealand. *Trans. N.Z. Inst.*, 63, pp. 154-170, pl. 23.
- POWELL, A. W. B., 1942. The New Zealand Recent and Fossil Mollusca of the Family Turridae. *Bull. Auckland Inst. Mus.*, 2.
- POWELL, A. W. B., 1944. The Australian Tertiary Mollusca of the Family Turridae. *Rec. Auckland Inst. Mus.*, 3 (1), pp. 1-68, pls. 1-7.
- PRITCHARD, G. B., 1896. A Revision of the Fossil Fauna of the Table Cape Beds, Tasmania with Descriptions of New Species. *Proc. Roy. Soc. Vic.*, 8 (n.s.), pp. 74-150, pls. 2-4.
- RAFINESQUE, C. S., 1815. *Analyse de la Nature ou Tableau de l'Univers et des Corps organisés*, Palermo.
- REEVE, L. A., 1859. *Conchologia Iconica*, London, 11.
- ROVERETO, G., 1899. Prime ricerche sinonimiche sui generi dei gasteropodi. *Att. Soc. Ligust.*, 10, pp. 101-110.
- SACCO, F., 1890. 1. Molluschi dei Terreni Terziarii del Piemonte e della Liguria. Part 6. *Mem. Accad. Sci. Torino*, ser. 2, 40, pp. 295-368, pl. 2 (reprinted and separately paginated).
- SACCO, F., 1890. 1. Molluschi dei terreni terziarii del Piemonte e della Liguria. Parte 8. Nota preventiva. *Boll. Mus. Zool. Anat. Comp.*, 5 (86), pp. 21-43.
- SACCO, F., 1891. *Id.*, pt. 10.
- SCHILDER, F. A., 1927. Revision der Cypraea. *Arch. Naturges.*, 91, A, 10, 1925, pp. 1-171.
- SCHILDER, F. A., 1932, in *Fossilium Catalogus*, 55, Cypraea.
- SCHILDER, F. A., 1933. Monograph of the Subfamily Eratoinae. *Proc. Malac. Soc.*, 20 (5), pp. 244-283.
- SCHILDER, F. A., 1935. Revision of the Tertiary Cypraea of Australia and Tasmania. *Proc. Malac. Soc.*, 21 (6), pp. 325-355, 50 figs.
- SCHLÜTER, F., 1838. *Kurzgefasstes systematisches Verzeichniss meiner Conchyliensammlung*, Halle.
- SCOPOLI, A., 1777. *Introductio ad Historiam Naturalem* . . . Prague.
- SCUDDER, S. H., 1882-4. *Nomenclator Zoologicus*. *Bull. U.S. Nat. Mus.*, 19.
- SOWERBY, G. B., 1839. *A Conchological Manual*.
- SWAINSON, W., 1831-2. *Zoological Illustrations*. Second Series, 2.
- SWAINSON, W., 1832-3. *Ibid.*, 3.
- SWAINSON, W., 1835. *The Elements of Modern Conchology*.
- TATE, R., 1878. The Fossil Marginellidae of Australasia. *Trans. Phil. Soc. Adel. for 1877-8*, pp. 90-98.
- TATE, R., 1885. Notes of a Critical Examination of the Mollusca of the Older Tertiary of Tasmania alleged to have living representatives. *Proc. Roy. Soc. Tas. for 1884*, pp. 207-214.
- TATE, R., 1886. The Fossil Terebridae of Australia. *Southern Science Record n.s.*, 2 (1), pp. 4-8 (*vide* Singleton).
- TATE, R., 1888. The Gastropods of the Older Tertiary of Australia (Part 1). *Trans. Roy. Soc. S. Aust.*, 10, pp. 91-176, pls. 1-13.
- TATE, R., 1889. The Gastropods of the Older Tertiary of Australia (Part 2). *Id.*, 11, pp. 116-174, pls. 2-10.
- TATE, R., 1899. On Some Older Tertiary Fossils of Uncertain Age from the Murray Desert. *Trans. Roy. Soc. S. Aust.*, 23 (1), pp. 102-111, pl. 1.
- TATE, R., and DENNANT, J., 1895. Correlation of the Marine Tertiaries of Australia. Part 2, Victoria. *Trans. Roy. Soc. S. Aust.*, 19 (1), pp. 108-121.

- THIELE, J., 1935. Handbuch der Systematischen Weichtierkunde, 2. Jena, Gustav Fischer.
 VERCO, J. C., 1895. A Revision of the Gastropods of South Australia. Trans. Roy. Soc. S. Aust., 19 (1), pp. 94-107, pls. 1-3.
 WEINKAUFF, H. C., 1879. Gattungen Marginella und Erato, in Martini & Chemnitz Syst. Conch.-Cab., 5 (4), p. 286.
 WOODS, J. E. TENISON, 1876. On Some Tertiary Fossils from Table Cape. Proc. Roy. Soc. Tas. for 1875, pp. 13-26.

EXPLANATION OF PLATES

PLATE 1

- Fig. 1.—*Proterato* (*Cypræcrato*) *subaustralis* sp. nov. Holotype, F 15179, apertural view, $\times 5$.
 Fig. 2.—*Proterato* (*Cypræcrato*) *subaustralis* sp. nov. Holotype, F 15179, dorsal view, $\times 5$.
 Fig. 3.—*Polinices* (*Conuber*) *subcarians* (Tate). Hypotype, F 15180, dorsal view, $\times 1.5$; protoconch, $\times 8$.
 Fig. 4.—*Polinices* (*Conuber*) *subcarians* (Tate). Hypotype, F 15180, apertural view, $\times 1.5$.
 Fig. 5.—*Polinices* (*Conuber*) *cunninghamensis* (Harris). Hypotype, F 15181, apertural view, $\times 1$.
 Fig. 6.—*Polinices* (*Conuber*) *cunninghamensis* (Harris). Hypotype, F 15181, dorsal view, $\times 1$.
 Fig. 7.—*Polinices* (*Conuber*) *balteatella* (Tate). Hypotype, F 15182, apertural view, $\times 2$.
 Fig. 8.—*Polinices* (*Conuber*) *balteatella* (Tate). Hypotype, F 15182, dorsal view, $\times 2$.
 Fig. 9.—*Tanca* *hamiltonensis* (Tenison-Woods). Hypotype, F 15183, apertural view, $\times 2$; protoconch, $\times 9$.
 Fig. 10.—*Tanca* *hamiltonensis* (Tenison-Woods). Hypotype, F 15183, dorsal view, $\times 2$.
 Fig. 11.—*Austrocochlis* *substolida* (Tate). Hypotype, F 15186, apertural view, $\times 1$.
 Fig. 12.—*Austrocochlis* *substolida* (Tate). Hypotype, F 15186, dorsal view, $\times 1$.
 Fig. 13.—*Tanella* *weymouthensis* sp. nov. Holotype, F 15184, apertural view, $\times 7$.
 Fig. 14.—*Tanella* *weymouthensis* sp. nov. Holotype, F 15184, dorsal view, $\times 1$.
 Fig. 15.—*Proxiuber* *microsculptum* sp. nov. Holotype, F 15185, apertural view, $\times 3$; protoconch, $\times 6$.
 Fig. 16.—*Proxiuber* *microsculptum* sp. nov. Holotype, F 15185, dorsal view, $\times 3$.
 Fig. 17.—*Tasmatica* *modestina* sp. nov. Holotype, F 15188, apertural view, $\times 6$; protoconch, $\times 9$.
 Fig. 18.—*Tasmatica* *modestina* sp. nov. Holotype, F 15188, dorsal view, $\times 6$.
 Fig. 19.—*Austrocochlis* *substolida* (Tate). Hypotype, immature, F 15187, apertural view, $\times 3$; protoconch, $\times 4$.
 Fig. 20.—*Austrocochlis* *substolida* (Tate). Hypotype, immature, F 15187, dorsal view, $\times 3$.

PLATE 2

- Fig. 1.—*Cassia* (*Hypocassia*) *salisburyensis* sp. nov. Holotype, F 15189, dorsal view, $\times 1$.
 Fig. 2.—*Cassia* (*Hypocassia*) *salisburyensis* sp. nov. F 15189, apertural view, $\times 1$.
 Fig. 3.—*Semicassia* (*Antephalium*) *muelleri* Tate. Hypotype, F 15190, apertural view, $\times 1$.
 Fig. 4.—*Semicassia* (*Antephalium*) *muelleri* Tate. Hypotype, F 15190, dorsal view, $\times 1$.
 Fig. 5.—*Argobuccinum* (*Argobuccinum*) *hussi* Angas. Hypotype, F 15192, dorsal view, $\times 1.5$.
 Fig. 6.—*Argobuccinum* (*Argobuccinum*) *hussi* Angas. Hypotype, F 15191, apertural view, $\times 1$.
 Fig. 7.—*Phos* *gregsoni* Tate. Hypotype, F 15401, dorsal view, $\times 1.5$.
 Fig. 8.—*Phos* *gregsoni* Tate. Hypotype, F 15401, apertural view, $\times 1.5$. a. Hypotype, F 15402, protoconch, $\times 5$.
 Fig. 9.—*Charonia* (*Austrotriton*) *armata* (Tate). Hypotype, F 15193, dorsal view, $\times 1$.
 Fig. 10.—*Charonia* (*Austrotriton*) *armata* (Tate). Hypotype, F 15193, apertural view, $\times 1$.
 Fig. 11.—*Charonia* (*Austrotriton*) *radialis* (Tate). Protoconch and first whorl, $\times 6$.
 Fig. 12.—*Trophon* (*Litozamia*) *goldsteini* Tenison-Woods. Hypotype, F 15199, $\times 1.5$.
 Fig. 13.—*Trophon* (*Litozamia*) *goldsteini* Tenison-Woods. Hypotype, F 15199a, $\times 10$.
 Fig. 14.—*Pterynotus* (*Pterochelus*) *trinodosus* (Tate). Hypotype, F 15197, $\times 3$.
 Fig. 15.—*Hexaplex* (*Murexsul*) *biconicus* (Tate). Hypotype, F 15196, $\times 1$.
 Fig. 16.—*Trunculariopsis* *peramangus* (Ludbrook). Hypotype, F 15194, $\times 1$.
 Fig. 17.—*Hexaplex* (*Murexsul*) *suboctogonus* sp. nov. Holotype, F 15195, $\times 1$.
 Fig. 18.—*Homolocanthu* *antecedens* sp. nov. Holotype, F 15198, $\times 1$.

PLATE 3

- Fig. 1.—*Hina* (*Reticunassa*) *subcopiosa* sp. nov. Holotype, F 15403, $\times 4$; protoconch, $\times 8$.
 Fig. 2.—*Hina* (*Reticunassa*) *sphalliscabra* (Chapman & Gabriel). Hypotype, F 15404, $\times 5$; protoconch, $\times 10$.
 Fig. 3.—*Olivella* (*Cupuloliva*) *nymphalis* (Tate). Hypotype, G 39650, $\times 3$.
 Fig. 4.—*Ancilla* (*Baryspira*) *tatei* Marwick. Hypotype, G 9376, $\times 1$.
 Fig. 5.—*Mitrella* (*Dentimitrella*) *lincolnensis* (Reeve). Hypotype, F 15400, $\times 4$.
 Fig. 6.—*Austromitra* *malesoni* sp. nov. Holotype, F 15406, $\times 4$.
 Fig. 7.—*Austromitra* *pauciplicata* sp. nov. Holotype, F 15407, $\times 4$.

- Fig. 8.—*Austromitra multiplicata* sp. nov. Holotype, F 15408, x 4.
 Fig. 9.—*Ancilla* (*Turrancilla*) *adelaidensis* sp. nov. Holotype, F 15405, x 3.
 Fig. 10.—*Marginella* (*Eratoidea*) *wentworthi* Tenison-Woods. Hypotype, F 15414, x 6.
 Fig. 11.—*Marginella* (*Eratoidea*) *glacensis* sp. nov. Holotype, F 15413, x 10.
 Fig. 12.—*Closia* (*Closia*) *planilabrum* sp. nov. Holotype, F 15415, x 10.
 Fig. 13.—*Gibberula clina* (Cotton). Holotype, P 8797, x 6.
 Fig. 14.—*Gibberula talla* (Cotton). Holotype, P 8796, x 7.5.
 Fig. 15.—*Volvarina* (?) *incommoda* sp. nov. Holotype, F 15421, x 5.
 Fig. 16.—*Closia* (*Closia*) *arena* (Cotton). Holotype, P 8794, x 10.
 Fig. 17.—*Serrata metula* (Cotton). Hypotype, F 15418, x 8.
 Fig. 18.—*Closia* (*Closia*) *dona* (Cotton). Hypotype, F 15416, x 5.
 Fig. 19.—*Serrata charma* (Cotton). Hypotype, F 15417, x 8.
 Fig. 20.—*Serrata weymouthensis* sp. nov. Holotype, F 15420, x 8.
 Fig. 21.—*Serrata bicrassiplicata* sp. nov. Holotype, F 15419, x 8.

PLATE 4

- Fig. 1.—*Ericusa* cf. *uncilloides* (Tate). Hd. Monno Para, Sec. 4251, x 0.9.
 Fig. 2.—*Ericusa ancilloides* (Tate). Holotype, T 396D, x 1.3.
 Fig. 3.—*Mitraria* (*Eumitra*) *diductua* (Tate). Paratype, x 1.3.
 Fig. 4.—*Harpa* (*Austroharpa*) *cassinoides* Tate. Holotype, T 692, x 1.7.
 Fig. 5.—*Harpa* (*Austroharpa*) *tatei* Finlay. Holotype, Finlay Coll. 67, x 1.3.
 Fig. 6.—*Mitraria* (*Eumitra*) *diductua* (Tate). Holotype, T 638, x 1.3.

PLATE 5

- Fig. 1.—*Xenuturris* (*Veruturris*) *bisculptus* Powell. Hypotype, F 15423, x 3.5.
 Fig. 2.—*Xenuturris* (*Veruturris*) *tomopleuroides* Powell. Hypotype, F 15422, x 2.
 Fig. 3.—*Epidirona powelli* sp. nov. Holotype, F 15424, x 1.5.
 Fig. 4.—*Syntomodrillia ludbrookae* Powell. Hypotype, F 15425, x 5.
 Fig. 5.—*Tomopleura ludbrookae* Powell. Hypotype, F 15465, x 4.
 Fig. 6.—*Maoritomella nutans* Powell. Hypotype, F 15426, x 6.
 Fig. 7.—*Guraleus* (*Guraleus*) *chapplei* Powell. Holotype, Abattoirs Bore, x 6 (redrawn after Powell).
 Fig. 8.—*Guraleus* (*Guraleus*) *ludbrookae* Powell. Hypotype, F 15427, x 7.
 Fig. 9.—*Guraleus* (*Euguraleus*) *powelli* sp. nov. Holotype, F 15429, x 7.
 Fig. 10.—*Guraleus* (*Euguraleus*) *adelaidensis* Powell. Hypotype, F 15428, x 10.
 Fig. 11.—*Guraleus* (*Paraguraleus*) *incisus* Powell. Hypotype, F 15430, x 3.
 Fig. 12.—*Guraleus* (*Paraguraleus*) *abbreviatus* Powell. Holotype, x 6.8 (redrawn after Powell).
 Fig. 13.—*Asperdaphne* (*Aspertilla*) *exsculpta* Powell. Hypotype, F 15434, x 10.
 Fig. 14.—*Filodrillia ludbrookae* Powell. Holotype, x 6 (redrawn after Powell).
 Fig. 15.—*Mappingia matronalis* sp. nov. Holotype, F 15431, x 7.
 Fig. 16.—*Etrema weymouthensis* sp. nov. Holotype, F 15432, x 4.
 Fig. 17.—*Veprecula* (?) *adelaidensis* Powell. Holotype, x 7.5 (redrawn after Powell).
 Fig. 18.—*Fenestrodaphne pulchra* Powell. Holotype, x 9 (redrawn after Powell).
 Fig. 19.—*Etremaopsis contigua* Powell. Hypotype, F 15433, x 10.
 Fig. 20.—*Pseudexomilus caelatus* Powell. Holotype, x 5 (redrawn after Powell).

PLATE 6

- Fig. 1.—*Amoria* (*Amoria*) *grayi* Ludbrook. Hypotype, F 15410, x 1.
 Fig. 2.—*Cymbiella* (*Cymbiella*) *tabulata* (Tate). Hypotype, F 15409, x 1.
 Fig. 3.—*Conus* (*Floraconus*) *adelaidae* sp. nov. Holotype, F 15436m, x 2.
 Fig. 4.—*Mitraria* (*Eumitra*) *coxi* sp. nov. Holotype G 39670, x 1.
 Fig. 5.—*Cancellaphera confirmans* sp. nov. Holotype, F 15412, x 4.
 Fig. 6.—*Aphera* (*Sydaphera*) *wannonensis* (Tate). Hypotype, F 15411, x 1.5.
 Fig. 7.—*Strioterebrum* (*Pervicacia*) *crassum* (Tate). Hypotype, F 15437, x 4.
 Fig. 8.—*Strioterebrum* (*Pervicacia*) *subspectabilis* (Tate). Hypotype, F 15438, x 4.
 Fig. 9.—*Hastula* (*Nototerebra*) *tenisoni* (Finlay). Hypotype, F 15439, posterior whorls, x 2.
 Fig. 10.—*Hastula* (*Nototerebra*) *tenisoni* (Finlay). Hypotype, F 15439a, anterior whorls, x 2.
 Fig. 11.—*Acteon scrobiculatus* Tenison-Woods. Hypotype, F 15440, x 4.
 Fig. 12.—*Semiactaeon tardior* sp. nov. Holotype, F 15441, x 3.
 Fig. 13.—*Semiactaeon stratosculptus* sp. nov. Holotype, F 15442, x 5.
 Fig. 14.—*Damoniella partisculpta* sp. nov. Holotype, F 15450, x 4.
 Fig. 15.—*Retusa* (*Semiretusa*) *canaligradata* sp. nov. Holotype, F 15443, x 2.5; protoconch of paratype, x 10.
 Fig. 16.—*Retusa* (*Semiretusa*) *apiculata* (Tate). Hypotype, F 15444, x 4.
 Fig. 17.—*Volvulella rostrata* (Adams). Hypotype, F 15446, x 4.
 Fig. 18.—*Cylichna angustata* Tate & Cossmann. Hypotype, F 15447, x 2.5.
 Fig. 19.—*Cylichna anticingulata* sp. nov. Holotype, F 15448, x 6.
 Fig. 20.—*Damoniella bullaeformis* Cossmann. Hypotype, F 15449, x 4.
 Fig. 21.—*Retusa* (*Semiretusa*) *coxi* sp. nov. Holotype, F 15445, x 3.
 Fig. 22.—*Nepatilla powelli* sp. nov. Holotype, F 15435, x 10.